SEPTEMBER 5, 1958

electronics

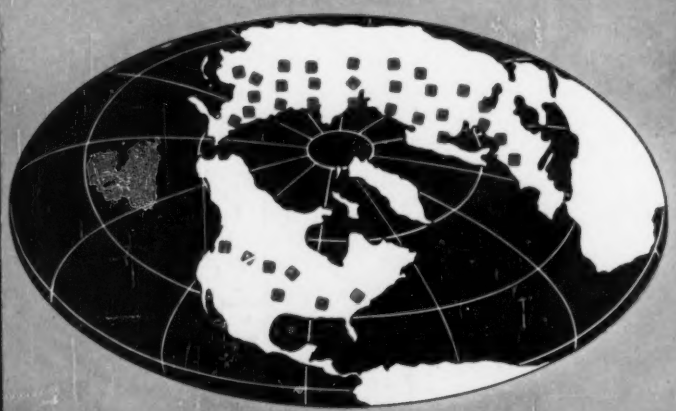
business issue

A McGRAW-HILL PUBLICATION • VOL. 31, NO. 36 • PRICE FIFTY CENTS

Solving Missile Reentry Problems

Electronics plays big part in designing effective missile nose cones...p 13

Can Electronics Check on Peace?



Any disarmament plan would need an electronic monitoring network ...p 15

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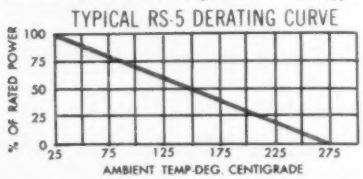

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Shoptalk . . .

IF PEACE BREAKS OUT. With 55 percent of electronics production destined for the military and an additional large portion earmarked to sustain manufacture and development of electronic weapons, many electronics businessmen ask themselves, "What happens to electronics if peace breaks out?"

One answer is that any effective disarmament plan must rely heavily on electronic detection and monitoring equipment.

Associate Editor Janis has looked into the applications of electronics in aerial inspection, atomic-bomb test detection, intercept of missile guidance signals and detection of missiles themselves. His story begins on p 15.

COLD NOSES. Packaging an ICBM payload was a big problem a couple of years back. Millions of dollars went into research to devise a nose cone that could stand up under the shock and heat of reentry. Now that problem has been solved, and more solutions are coming.

Solving that problem was a feather in the cap of electronics technology, although it pushed hard against a few technological barriers. Another problem is arising—getting communications through the ionized airstream that shields the cone.

To document the part electronics played in the success of nose cone development projects, and to get a bead on the size of the communications problem, Associate Editor Leary visited some of the laboratories where the work was done, talked to researchers, checked with the USAF's planners. His story begins on p 13.

ATOMIC WINGS. Primary effort in nuclear flight propulsion is still aimed at getting satisfactory propulsion reactors. Electronics' assignments control a power that can't be regulated with a turn of a fuel valve.

Checking to see what has been happening in the field since his last report in the December 10 issue, Associate Editor Sideris finds things popping.

A rocket reactor will be tried on the ground this year. The Navy is planning nuclear seaplanes soon, and ARDC is eyeing propulsion by controlled nuclear explosions. The story is on p 18.

CONSUMER SALES UP IN FALL? Early summer saw an increase in picture-tube production as well as radio and tv receiver production.

Manufacturers of home entertainment gear are readying sales campaigns based on a widely held opinion that this fall will see more sales volume than the entertainment section of the electronics industry has enjoyed for some time.

Associate Editor Emma's questions to sales managers, and other spokesmen for manufacturers bring out some facts about new shapes and colors in radios, remote tuning for tv sets, and flexible stereo component arrangements as basic sales ammunition. Details on what lies in the immediate future are on p 17.

Coming In Our September 12 Issue . . .

Coming In Our September 12 Issue . . .

● **Solid-State X-Ray Amplifier.** Adjacent layers of photoconductive and electroluminescent materials sandwiched between a pair of electrodes form a panel amplifier similar to a conventional fluoroscope screen, but without bulky accessory equipment. B. Kazan, of RCA Laboratories in Princeton, describes how X-ray excitation of the photoconductor increases its conductivity, with corresponding current flow through the phosphor producing light emission.

The panel in its present stage of development is potentially useful for viewing of nonmoving parts of the body. High light output permits viewing in a moderately lighted room. Because of image persistence and light amplifying properties, X-ray dosages are kept low.

● **Ruggedized Telemetry Keyer.** An airborne pulse duration modulation system is ideally suited to transistor circuits, according to D. A. Williams, Jr., of Bendix Aviation. His article describes a pdm keyer designed to exploit the switching properties of transistors to meet military requirements for high linearity, low crosstalk, and high effective input impedance.

A bistable flip-flop, linear ramp generator and voltage comparator make up the unit which provides output pulses with widths proportional to the amplitudes of signals sampled at a rate of 900 a sec. Printed circuit techniques incorporating silicon transistors insure reliability and long life under severe environmental stress.

● **Spooks and Snivets.** A sense of humor helps the gremlin-beset circuit designer somewhat, but education in certain peculiar effects in electron tubes is of greater value. In his article, W. E. Babcock of RCA's Electron Tube Division presents a survey of problems that arise from the anomalous behavior of vacuum tubes in certain circuits.

This behavior is usually not mentioned in a manufacturer's tube data, nor is it described in any circuit textbook. Babcock's description of cause effect, and cure for each case is bound to end sleepless nights, but unfortunately won't restore torn-out hair.

● **Distance Computer.** A distance-measuring technique, which uses modified aircraft communications transceivers, is described by Harry Vantine, Jr., and Einar C. Johnson of the Naval Air Development Center at Johnsville, Pa.

Two transceivers form a responder-interrogator combination between an aircraft and a ground station. By measuring the time lapse between interrogator and responder pulse, distance can be measured to 0.1-mi accuracy. Precise time delays built into both ends of the system allow turn-around time for the transceivers.

electronics business issue

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Can Electronics Check on Peace? East-West technical accord recently reached in Geneva outlines methods to check on nuclear tests. Here are ways electronic equipment can check on nuclear explosions and tests of other advanced weapons.....p 15

Home Music Sales to Rise. Fall promise of new sales records spurs tv, radio and phonograph manufacturers to offer many novel designs. Merchandising efforts aimed at home consumers shift into high gear..p 17

Electronics for New Bomber. First photo of bomb-nav system for B-58 supersonic bomber reveals a complete auxiliary inertial stable platform..p 17

A-Plane Awaits Engines. Electronics industry watches, waits as Air Force retrenches to concentrate on powerplant design and control, Navy works on nuclear seaplane. AEC plans to ground-test nuclear rocket propulsion concept this year.....p 18

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Optimism Mounts

Profits may be good in fourth quarter. Most first half earnings are down, but situation is improving

THERE IS A NEW NOTE of optimism in recently issued first half earnings reports of electronics industry firms. Turning point in profits has been reached, the reports indicate.

True, earnings are down from first half of 1957 for many firms. Only six firms out of a sample group of 28 members of the industry increased earnings in the first six months of 1958 over the same period in 1957 (see table).

However, three out of 28 reported first half profits almost as good, down 2 per cent or less. Moreover, a number of company heads commented that second quarter profits this year exceeded profits in second quarter of last year and/or first quarter of 1958.

But, profit and loss figures so far reported this year obscure the current profit picture and third and fourth quarter prospects.

Sales for most companies are on the way up because of higher military spending. Higher spending rate started to make itself felt in May and June. Its impact will be stronger throughout remainder of the year.

Also, past period of recession and contract cutbacks has taught many firms to trim frill expenses and tighten up on operations in general.

Result, third quarter earnings should show further improvement and fourth quarter earnings could be good. Pickup among firms selling to consumer markets, and lacking stimulus of military spending, may be more moderate.

	First Half Profits		Percent
	1958	1957	Change
Admiral Corp.	d-$407,000[1]	$221,000	down N.C.
Aerovox Corp.	48,000	332,000	down 85.6
Amphenol	631,000	944,000	down 33.2
Consolidated Electrodynamics	30,000	911,000	down 96.7
Cutler-Hammer[2]	2,199,000	3,386,000	down 35.1
Electronics Corp. of America	41,000	128,000	down 68.0
Erie Resistor	207,000	444,000	down 53.4
Fansteel Metallurgical	645,000	1,742,000	down 63.0
G.M. Giannini	203,000	207,000	down 1.9
General Dynamics	20,052,000	20,337,000	down 1.4
General Electric	103,381,000	127,823,000	down 19.0
Hoffman Electronics	804,000	864,000	down 6.9
IBM	50,598,000	40,062,000	up 26.3
International Resistance	d-71,000	236,000	down N.C.
Lear, Inc.	630,000	326,000	up 93.2
Mallory	924,000	1,881,000	down 50.9
Minneapolis-Honeywell	8,956,000	10,304,000	down 13.1
Muter Co.	89,000	152,000	down 41.4
Packard Bell	634,000	463,000	up 36.9
RCA	13,544,000	20,311,000	down 33.3
Raytheon	3,890,000	2,296,000	up 69.4
Sangamo Electric	287,000	1,787,000	down 83.9
Servomechanisms	7,000	103,000	down 93.2
Standard Coil Products	25,000	1,000	up N.C.
Sylvania	2,583,000	4,789,000	down 46.1
Tung-Sol	980,000	1,603,000	down 38.9
Westinghouse Electric	29,973,000	30,615,000	down 2.1
Zenith	2,990,000	2,398,000	up 24.7

d-deficit N.C.-not calculated, change exceeds 100 percent

[1] after deducting non-recurring charge of $400,000

[2] includes Airborne Instruments earnings both halves

SHARES and PRICES

NUCLEAR SUB TRIPS beneath the polar ice cape last month and the *Triton's* recent launching are among reasons increased attention is now being given future prospects of nuclear and/or atomic instrumentation stocks.

Nuclear propulsion systems, like those on *Nautilus* and *Skate*, are a major source of nuclear instrumentation business. Other important sources are electric power, test, research and medical reactors; and industrial and medical users of radio isotopes.

Nuclear instrument sales should grow rapidly in the next few years. Sales, estimated at $48 million for 1958, are expected to hit $65 million in 1960 and $80 million in 1962 (ELECTRONICS, Special Market Report, p 22, May 16).

Of the five firms listed below, two reported profits for the first six months of this year and three reported deficits. Rising sales and improving operational efficiency are expected to sweeten future profits.

Nuclear instrumentation's promising future has resulted in several score firms trying to serve this market. However, most are either publicly owned, or nuclear instrumentation is a minor activity.

Typical Atomic Instrumentation Manufacturers	Recent Price	Latest 12 Mos. Dividend	Percent Yield	Earnings Per Common Share 1958	Period	1957	Traded	1958 Price Range
Baird-Atomic	8½[1]	....	...	d-0.55	(6 mos)[3]	0.04	OTC	6¾–12¼
High Voltage Engineering	33[1]	0.10	0.3	0.54	(6 mos)	0.40	OTC	23¼–34
Nuclear-Chicago Corp.	22[1]	[2]	...	0.60	(6 mos)[4]	0.30	OTC	14¼–24¾
Tracerlab	7½[1]	....	...	d-0.32	(6 mos)	d-1.60	OTC	3¾– 7¾
Victoreen Instrument	4⅝	....	...	N.A.	(year)	0.45	ASE	3¾– 5⅛

d—deficit N.A.—not available

[1]bid [2]stock dividend [3]period ended March [4]period ended Feb.

MERGERS, ACQUISITIONS and FINANCE

• **Businessmen** look for fourth quarter business pickup, latest **Dun & Bradstreet** survey of businessmen's opinion finds. Some 55 percent of 1,500 participating executives from all types of concerns expect fourth quarter sales to better final quarter sales of 1957. Durable goods manufacturers, the group which includes many buyers and producers of electronic equipment are more optimistic, with 60 percent looking forward to sales increases.

The same manufacturers are also more confident about profits in the last quarter. Forty-four percent of them anticipate an increase, as against 38 percent in the all-company group.

A little over half of all manufacturers interviewed by the credit agency foresaw a pickup in new orders in the fourth quarter.

• **Texas Instruments** sets best six-month sales mark in its history. Sales for the first half of 1958 were $42.2 million, an increase of 37 percent over the same period in 1957. Net income was $2.1 million or $0.66 per share, up 25 percent from $1.7 million or $0.52 per share earned in first half of 1957.

For the second quarter TI had sales of $21.7 million and earnings of $1.0 million. This compares with sales of $15.6 million and earnings of $930,000 for 1957's second quarter.

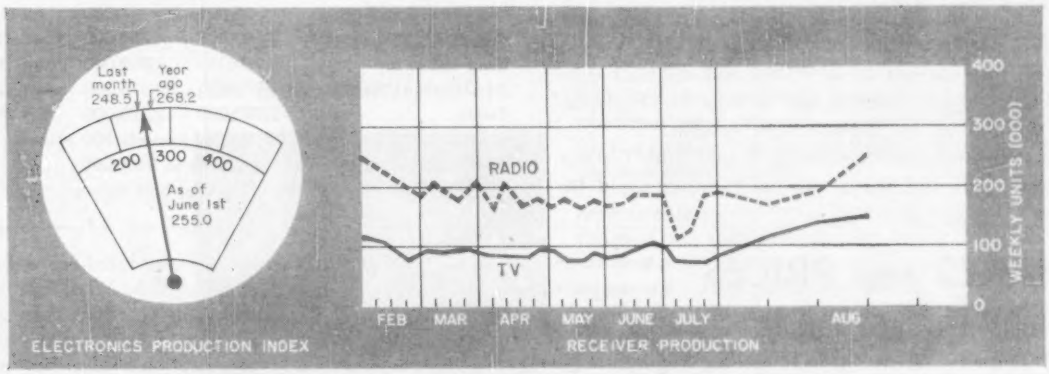
• **Sperry Rand's** earnings for the three months ended June 30, the first quarter of its fiscal year, were 60.9 percent less than a year earlier. Net income totaled $3.9 million or $0.13 per share, against $10.0 million or $0.35 per share for the first quarter of preceding year.

However, net sales declined only by 1.5 percent, from $213.2 million for first quarter of fiscal 1957 to $210.1 million in the 1958 quarter.

Earnings for the full fiscal year should be better than for the preceding year, assuming a continued upturn in business conditions, comments Sperry Rand's president, H. F. Vickers. But he doubts that profits will equal those of the 12 months ended March 31, 1957.

• **Laboratory for Electronics,** located in Boston, Mass., arranges for an increase in maximum borrowings under V-loan agreements from $2.8 million to $5 million. Increased credit will be used to finance the recently received $23-million Air Force production contract for Doppler navigation systems.

• **Admiral** discontinues unprofitable operation of its **Molded Products Division** which made plastic tv set cabinets. Losses from the division were $302,000 in 1956, $940,000 in 1957 and $1 million in 1958, including $400,000 applicable to the liquidation. Chicago tv firm found sporadic demand for plastic products.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	Aug. 15, '58	Aug. 8, '58	Aug. 16, '57
Television sets, total	124,527	114,556	179,615
Radio sets, total	227,114	168,196	294,091
Auto sets	45,565	42,693	96,206

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	Aug. 20, '58	Aug. 13, '58	Aug. 21, '57
Radio-tv & electronics	51.25	52.29	47.18
Radio broadcasters	66.73	65.70	60.77

FIGURES OF THE YEAR

	Totals for first six months		
	1958	1957	Percent Change
Receiving tube sales	190,406,000	221,175,000	—13.9
Transistor production	18,452,324	11,199,000	+64.5
Cathode-ray tube sales	3,689,587	4,814,659	—23.4
Television set production	2,167,930	2,722,139	—20.4
Radio set production	4,961,293	7,187,294	—31.0

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

(Source: Bur. Labor Statistics)	June, '58	May, '58	June, '57
Prod. workers, comm. equip.	339,300	336,100	394,200
Av. wkly. earnings, comm.	$82.78	$80.96	$79.59
Av. wkly. earnings, radio	$82.21	$79.98	$76.97
Av. wkly. hours, comm.	39.8	39.3	40.4
Av. wkly. hours, radio	40.1	39.4	40.3

TRANSISTOR SALES

(Source: EIA)	June, '58	May, '58	June, '57
Unit sales	3,558,094	2,999,198	2,245,000
Value	$8,232,343	$7,250,824	$6,121,000

TUBE SALES

(Source: EIA)	June, '58	May, '58	June, '57
Receiving tubes, units	36,270,000	36,540,000	35,328,000
Receiving tubes, value	$31,445,000	$31,406,000	$31,314,000
Picture tubes, units	725,846	560,559	1,104,013
Picture tubes, value	$14,203,381	$11,237,147	$19,981,319

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Dymec DY-5150 Data Scanning/Recording System

● Radar Simulator Systems

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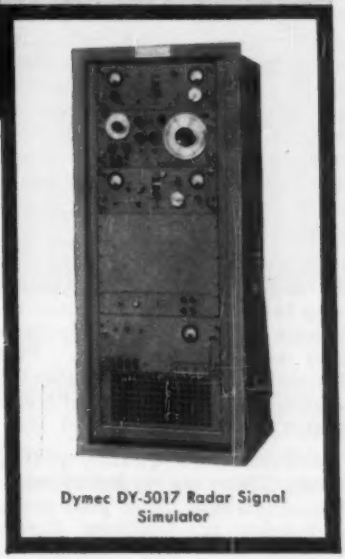

Dymec DY-5017 Radar Signal Simulator

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CIRCLE 4 READERS SERVICE CARD

WASHINGTON OUTLOOK

AF Protests Missile Cut

THE PENTAGON's military professionals—particularly in the Air Force—are grumbling loudly once more about budget restrictions. Defense Secy. McElroy hasn't turned out to be as big a spender as expected.

Output of missile prototypes for testing is much lower than Air Force development officials want, and planend production rates of IRBM's and ICBM's are well below what Air Force strategists recommend.

This is what's behind the claim that during 1960-64 U.S. deterrent power, now represented by our superior heavy manned bomber force, will be offset by Soviet missile might.

According to some Air Force officials, the U.S. plans only 14 liquid-propellant ICBM squadrons in the U.S. with a total of 130 missiles and 10 overseas IRBM squadrons over the next four years. Air Force strategists reportedly want about 4,000 long-range missiles by 1962. Intelligence sources reportedly say the Soviets will have ICBM stocks about eight times as large as ours in 1962 and 16 times as large in 1964. Air Force figures don't include Navy plans for nuclear submarines armed with Polaris IRBM's. Nine have already been authorized.

The Air Force grumbling is reflected in a Senate speech by John Kennedy (D. Mass.) on the 1960-64 gap in U.S. deterrent power. Kennedy's speech could be taken as a sign that the Democrats plan to exploit defense as an issue in the upcoming elections. This criticism from the military pros comes against the background of administration plans to boost defense spending by some $2 billion this year. But the critics argue that much of this money will be consumed by inflationary cost increases and pay raises, rather than by a significant boost in military R&D or hardware production.

- **The Defense Dept.** is studying recommendations from the Electronic Industries Assn. for simplification of military procurement policies. EIA's recommendations were drafted by a committee headed by F. E. Greene, RCA's manager of defense marketing negotiations.

  The EIA committee criticized the armed services' emphasis on contractor cost estimates in fixed-price procurement contracts where cost reimbursement is not an issue. Said the committee: "The manner in which the electronics industry produces most military equipment precludes our accounting system from providing unit costs in the manner apparently contemplated" by a proposed change in Pentagon regulations. The committee called for establishment of firm prices in price-redetermination contracts "as soon as practicable, to meet congressional requirements for precise budgeting, and to impose on the contractor a form of contract that provides the maximum incentive for efficient performance."

- **In the congressional** rush to adjourn, the Renegotiation Act was renewed for six months (to June 1959) rather than for the two years sought by the administration. The lawmakers plan a thorough investigation into the defense contract renegotiation program next year, paving the way for some of the liberalized provisions sought by industry.

IMPORTANT DEVELOPMENTS AT JPL

PIONEERS IN EARTH-SPACE COMMUNICATIONS

The exploration of outer space will take a new step forward with the completion of the new giant radio antenna being installed by JPL near Barstow, California. This huge "dish," 85 ft. in diameter, will enable the Laboratory scientists to probe still farther into space problems.

Information thus obtained and combined with lessons still being learned from the successful Army "Explorer" satellites, will provide invaluable basic data for the development of communication systems to serve space exploration programs. Long range communication will begin as a one-way link from space to earth, developing later into tracking and communicating with lunar vehicles at far greater ranges.

This activity will be part of a great research and development program to be operated jointly by JPL and the United States Army Missile Command.

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CIRCLE 5 READERS SERVICE CARD

EXECUTIVES IN THE NEWS

Glennan: for NASA, big plans

APPOINTMENT last month of T. Keith Glennan as head of National Aeronautics and Space Administration brings a top-drawer engineer and administrator into a new job that will have powerful impact on electronics. For as he calls the shots on lunar and interplanetary exploration, he'll be determining in large measure the direction of electronic R&D.

Glennan, who will be 53 next Monday, was born in Enderlin, N. D., worked his way through Yale (BSEE cum laude 1927), and first worked as an engineer for Western Electric. Sound systems were his specialty; he stayed in that field for WE and the motion picture industry until 1942. During the war he directed the Underwater Sound Labs in New London, Conn., was awarded the Medal for Merit. For two years after V-J Day he was an executive at Ansco.

He went to Case Institute as president in 1947, transformed it from a Cleveland-oriented school of applied science into a nationally recognized institute of technology. In 1950 he took on an additional burden as member of the Atomic Energy Commission—"it hardly affected his stride," an associate recalls. To get NASA off the ground he's taken a leave of absence—but he hasn't resigned.

Associates in Cleveland think of him as having an "absolute genius for organization," always "figuring out his moves fifteen or so ahead." He likes big plans, feels that people will fall in with a big plan quicker than with a small step. It was big plans that overhauled Case, and that will overhaul our space technology.

A forceful and dynamic personality, the stocky Glennan focuses his mind like a searchlight on one topic at a time. He makes the best possible use of people and facilities at hand, hasn't yet built NASA beyond the nucleus provided by 43-year-old National Advisory Committee on Aeronautics. On a recent Friday he commented "NASA is already two weeks old; it's time we got a little work done."

Glennan was married in 1931 to the daughter of one of his Yale professors, has four children. He has resigned from the boards of the several firms which were using his talents as a director, remains active in public affairs (he's still on AEC's advisory committee). In his spare time he goes around the links when he can, does "a little hunting."

COMMENT

The Gear and The System

One of our engineers has just called my attention to a letter in your July 4 issue (p 124) from J. L. Langevin. In it he states that the photo on p 13 of your May 30 issue shows a prototype radar tracker-plotting system which he says was developed by the systems

engineering facility of RCA Service Co.

May I make a correction on this. The radar in the picture is a Sperry Gyroscope radar modified by Ford Instrument Co. for this particular use. And in the large truck at the left is the specially developed plotting board designed by Ford Instrument Co.

Ford Instrument Co. has continued its work in this field . . .

S. H. McAloney
Ford Instrument Co.
Long Island City, N. Y.

Reader McAloney's correction is actually an amplification. Key word in Reader Langevin's letter is "system": according to Langevin, Sperry and Ford built the gear on subcontract to RCA Service Co., which put the system together.

Receiving Tubes and Kudos

In Electronics (July 18, p 101) there appeared an article called "Ceramic Receiving Tube Report" dealing with work done by the Advisory Group on Electron Tubes for the Assistant Secretary of Defense for Research and Engineering.

We have had several requests from our engineering personnel regarding the information in this article . . . We have the conference reports of this group, but they are always published late. The 1956 conference (September) was just published this spring. I wondered therefore if you could tell me what conference the article covered, and the date . . .

I would like to say that I feel, and know that our readers of Electronics feel, that the magazine has gained in value since becoming a weekly publication. The material in both issues is current, well presented and concise.

Jack Baltes
Globe-Union Inc.
Milwaukee, Wisc.

The information in the article was derived from a paper delivered by J. O. McNally of Bell Labs at the EIA's Electronic Components Conference in Los Angeles, Apr. 22-24.

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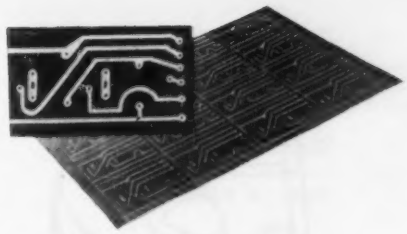

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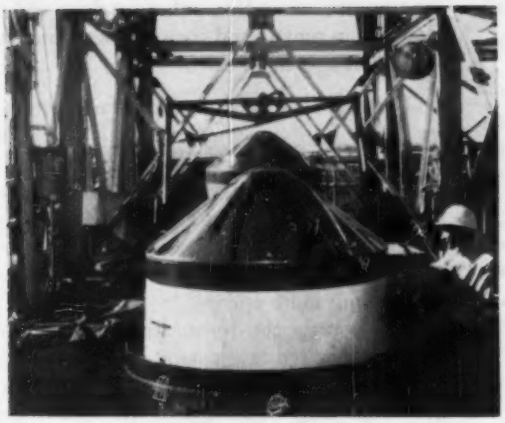


Blunt-nosed Atlas peers through top level of its gantry at Canaveral, proof of major breakthrough in packaging technique

Solving Reentry Problems

Electronics tackles rugged environmental situation to devise a container for sensitive gear carried in missile nose

HEAT is an old familiar problem for electronics, but nowhere so tough to solve as in the design of an ICBM nose cone. And now that the big birds are successfully flying, details about today's cones and the generation currently being readied for Minuteman are filtering out of the Defense Department.

The missile nose cone is a package, the container for the payload. In test, payload is mostly electronic measuring, recording and telemetering gear. When the chips are down, it would be a nuclear warhead.

Building a nose cone has meant:

• **Research in materials** to find substances that can sink the heat, dissipate it, or even—although this is only a wild hope—use it to provide some more needed form of energy.

• **Research in methods** to select the best one for getting rid of the heat: by heat sink, dissipation or ablation. These respectively swallow up the energy, pass it along to dissipating elements, or permit overheated layers to flake off.

• **Research in communications** to find a way of getting test data through the ionized air built up in front of the cone, which blankets electromagnetic radiation as effectively as the ionosphere.

Materials and Methods

Electronics has been the right hand of materials and methods research chiefly in simulating the reentry environment and measuring the effects of that environment on materials. It's testing with a vengeance, pushing forward with developments like:

• Air- and water-stabilized arcs (cover) capable of producing streams of dissociated air particles (plasma) heated to twice the surface temperature of the sun and moving at Mach 15-25.

• Long shock tunnels for aerothermodynamic studies which drive air heated to 18,000 F over material specimens at 5,000 psi.

• Solar furnaces to make clean 3,000 C heat.

• Arc-discharge hypersonic guns which can speed a projectile to 60,000 fps for free-flight studies.

Having built the environment, the researchers jammed up against several other technological barriers. Measuring such violent accelerations, vibrations and velocities, such extremes of heat, airflow and pressure, required the development of new thermocouples, accelerometers and other transducers. Measurement of thickness and stress in ablative-system studies was not so great a problem, except that finding a strain gage to work under 10,000 C temperature conditions caused some headaches.

Defense Department will not permit the story to be told of how these barriers were pushed forward. "It would give away," one spokesman told ELECTRONICS, "the speed, the angle of entry, almost all the capabilities of Thor, Atlas and Jupiter."

The Atlas nose cone cost Uncle Sam $158 million to develop. It has a blunt exponential-curve topology, is made of copper to sink heat, micropolished to prevent eddies that could complicate heatflow. Besides its test and recording gear, it carries instruments to stabilize it in flight during its long unpowered trajectory.

Jupiter, the Thor-Ables now being tested, and the projected Minuteman, will use an ablative nose cone. Ablative technique requires nonconductive materials

like Fiberglas or Pyroceram. These materials burn at the surface, flaking off as they do and thus removing heat as it accumulates.

Transpiration is another technique being investigated. A transpiring shield will use conducting materials and heat-dissipating elements placed elsewhere. Heat will be conducted away from the shield and dissipated into the surrounding air.

What researchers would really like: a nose cone made up of a mosaic of transducers that would transform heat into thrust (for a missile) or lift (for a reentering space vessel). The possibility: "remote at this time," says a researcher who would know.

Communications

Second major technological barrier—still to be breached—is in communications (see "Ions Make Trouble at Mach 10," ELECTRONICS, p 13, Mar. 7).

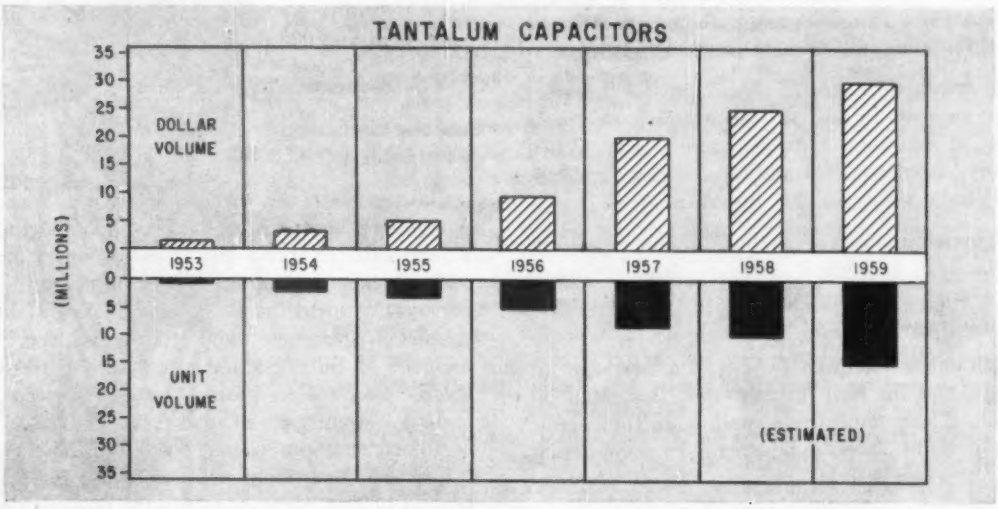
Operating in extremes of heat and flow and in the presence of an ionized airstream, it was first necessary to devise an antenna to stand the environment. Then there was the problem of carbonization of the window through which the antenna looks. Changes in pressure across this orifice produce additional distortions in signal. And even the best antennas change their tuning when heated.

Ferramics and other heat-resistant materials helped in building antennas, and materials that resist carbonization were devised for the windows. A servo matcher was developed to sense a mismatch in antenna tuning, and adjust antenna-circuit capacitance to retune. But there was always that ionized airstream, through which there seemed to be no way of pushing radio energy.

To back up the telemetering transmitter during tests, researchers use a tape recorder. It is ejected from a point behind the shield seconds before impact and floats to earth with the data. Instrument is built with all semiconductor circuits, uses tape that won't melt in the heat. But, as one GE man told ELECTRONICS: "it's all right for backup, but you don't get immediate data when you need it."

Engineers hope to make use of techniques turned up by information theory to find a system of modulation that will get data through on a frequency low enough to penetrate the barrier and still high enough to permit efficient missile-borne transmitter gear.

PRODUCTION and SALES



Tantalum Capacitor Sales Continue Upward

PRODUCTION of tantalum capacitors will probably reach 15 million units by the end of 1959, representing $30 million at the factory door.

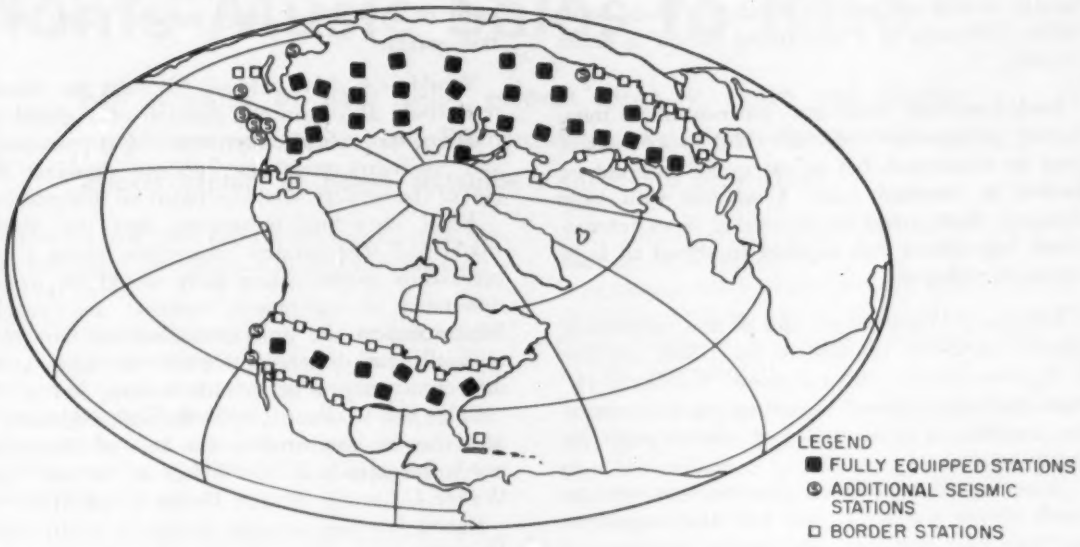
A recent survey by ELECTRONICS puts 1957 production at about eight million units, worth $20 million. High estimate for 1956 volume was seven million capacitors, worth $11 million.

Between 1956 and 1958 average unit price rose about 30 percent. A major factor in that rise was the increase in armed forces' use of tantalum capacitors. Typical military types cost from five to eight times as much as common commercial units.

Tantalum metal, formerly reported in short supply, is no longer said to be scarce. Refinery output is reported to have doubled in the first six months of 1958.

Refiners can now fill orders within a few weeks.

Electronics uses over half of all tantalum ore to make four kinds of tantalum capacitors now in use: wire, foil, sintered-slug liquid-electrolyte and solid-electrolyte. Military takes about two-thirds of the wire units and much of the three other kinds.



Can Electronics Check Peace?

East-West technical accord outlines methods of detecting nuclear explosions. How the diplomats will follow up is the big question

Geneva talks, however, have stirred interest in electronics for disarmament inspection. Recent Columbia U. report discusses systems

TECHNICAL blueprint for disarmament may be emerging, starting with the understanding reached last month between U. S. and Soviet scientists at Geneva on methods for detecting and identifying nuclear explosions.

Diplomatic follow-up by East and West on the technical solutions is the big question. If there should be a political agreement to ban nuclear tests, other disarmament problems may be tackled.

In a 40-page joint report not yet public as ELECTRONICS went to press, Eastern and Western scientists are believed to recommend about 180 monitoring stations all over the earth. Brief communique discloses agreement on four methods of detection:

• **Recording of acoustic and hydroacoustic waves.** Sensitive microbarometers could detect acoustic waves created in the atmosphere by nuclear bomb explosions. Sensitive hydrophone detectors could detect underwater explosions.

• **Recording of seismic waves.** Seismographs sophisticated enough to differentiate between natural and man-made phenomena would probably be used. They would detect not only underground blasts, but also seismic waves transferred to the ground by air, underwater and surface explosions.

• **Detection of electromagnetic energy found in the atmosphere following a nuclear explosion.** This would involve photocells to detect visible light and low frequency receivers to detect radio noise.

• **Collection of samples of radioactive debris.** Electronic devices such as Geiger counters might be used in this connection.

During the Geneva talks Russian and U. S. delegates received copies of "Inspection for Disarmament," a pioneering study report undertaken for the Institute of War and Peace Studies at Columbia University. In fact, East-West conclusions on nuclear detection methods parallel a proposal by Columbia physics professor Jay Orear, one of the group of scientists and experts who contributed to the study.

In addition to methods of detection, Orear proposes 25 monitoring stations in the USSR and 7

in the U. S. These, he says, would be the minimum needed so that any possible bomb test would occur within 300 miles of a monitoring station in either country.

Such a network could carry out continuous monitoring, perhaps automatically. The stations might even be unmanned, but in any event need not be located in classified areas. Confusion with large chemical blasts could be eliminated if an international inspectorate was required to attend all large chemical explosions.

Map on p 15 gives some idea of how monitoring stations might be arranged in the USSR and the U. S., according to Orear's proposal. Number of stations might be reduced if existing seismic stations are required to send copies of their records to inspectorate.

If an East-West political agreement on nuclear bomb testing is reached, there are other inspection problems that might be considered. Detection of high-altitude missile tests might be the second disarmament problem tackled by East-West experts.

The Columbia report, widely circulated in top government and United Nations circles, asserts that a network of stations equipped with radars could monitor missile launchings on a world-wide basis.

Study report says missiles could be detected before they shed their first stages. It suggests that radars for this purpose could probably be located at the same stations that monitor nuclear tests.

Required radar range would depend on the detection altitude agreed to, but would not exceed 1,000 miles in any event, says D. G. Brennan, MIT mathematician who wrote the report section on detection of high-altitude missile tests.

System based on a 40-mile detection altitude, he says, might cost $4 billion for about 400 stations that would put every point on earth 567 miles or less from at least one station. This, Brennan says, is the smallest system that could be considered. He estimates it would cost about $300 million a year to operate.

Some 1,600 stations costing about $16 billion would be needed, he says, if a 10-mile detection altitude was desired. Operating cost for such a system, he estimates, would be $1.2 billion a year.

Infrared detection might supplement radar, although Brennan says "there seems little doubt that the rocket plumes alone could provide a sufficiently reflective target" for present radar.

There are some infrared experts who feel that recent developments in that field make infrared detection equally, if not more desirable. They say infrared detection of a missile's heat exhaust is more effective than dependence on a reflective target for radar. Recently Britain reported development of a 1,000-mile range infrared missile detection system.

World-wide radar network for detecting missile tests could also form the skeleton of a global air traffic control scheme, says report. Data processing and communications gear, perhaps doubling the cost of the network, could be added for that purpose.

Aerial inspection techniques, says the report, would find their greatest capabilities during a war preparation period when there would be sizable movement of equipment, material and people. Meteorological and time limitations are too great, especially for detecting ICBM's, to make aerial inspection practical as an early warning system.

"The task of identifying underground launching sites may be compared to the task of discerning manhole covers from 50,000 feet in the air," says Walter J. Levison, Boston University physicist.

Report says mutual aerial inspection might cover 15 million sq mi now, but the capability of submarines for launching missiles would increase the area to be inspected to 200 million sq mi.

If a disarmament agreement provided that each side had an aerial blueprint of the other's territory, electronic devices could be used to check on possible war preparation trends. Means could include:

- Tools of military reconnaissance in three parts of the spectrum: visible from 0.3 to 0.7 microns, infrared, from 1 to 15 microns, and 1 to 10-cm region used by airborne radar.

- Closed-loop tv system capable of transmitting information continuously to a ground station for recording and later analysis.

Levison believes any aerial inspection scheme would depend largely on the visible portion of the spectrum, with electronic instruments used for special purposes.

If there should be a disarmament agreement on mass destruction weapons, the report suggests that the critical act of evasion that an inspection system might now be designed to prevent would be the clandestine production of some 200 to 400 ICBM's. This and other preparations might be detected by an aerial inspection system using: electronic camera controls, infrared instruments, passive radar and closed-circuit tv.

Electronic plants and other selected industries could be detected at scales of about 1:10,000 by a photographic inspection system. Levison says the Air Force's RB-47 medium reconnaissance plane, with seven precision cameras in four installations, is sufficiently equipped to do this—as well as to check transport centers, military installations and carry out limited area search—all on a weekly basis.

Home Music Sales to Rise

Fall promise of new sales records spurs tv, radio and phonograph manufacturers to offer many novel designs. Merchandising efforts aimed at home consumers shift into high gear

CONFIDENCE in a brisk Fall market is evident in the sales campaigns shaping up now for the home entertainment business.

An all-industry consumer expenditure forecast by one major manufacturer estimates: that the hi-fi market will take in more than $400 million; standard phonographs, $125 million; records, $400 million. Tape recorders are expected to gross about $140 million, with an additional $50 million spent for prerecorded tape music.

Most phonograph manufacturers have plans for a line of stereophonic equipment. One firm announces 31 different models of two-channel record players. In a bid for the whole spectrum of consumer buying, suggested retail prices for stereo equipment go from $130 to $2,500. Add-on second channels range from $90 to $160.

Higher priced stereo console units are being assembled in cabinets made of a variety of furniture hardwoods. Many consoles include a-m/f-m receivers. A few manufacturers are including tv receivers.

Some features of the new record players are: changers that will manipulate a mixed stack of 10 and 12-inch disks, automatic shut-off mechanisms, two-way electrostatic loudspeakers, and cabinets made of solid hardwood 13/16 inch thick.

In radios, major emphasis appears to be in portables, table radios, and clock radios. An increasing number of transistorized portable radios using flashlight batteries are slated for promotion. Others are a-c/d-c models that operate from battery or line current.

One manufacturer foresees a good market for a transistorized short-wave portable with earplug speaker. This all-transistor model contains an added r-f stage which the maker claims will increase pickup power 300 percent. Its output is reported at 275 mw.

Old Sol or a 100-watt lightbulb will supply power for another transistor model now headed for market. The sun-powered portable is priced at about $75.

Tv sales will most likely rely on new cabinet design and remote tuning for customer appeal.

Remote wireless tuners are available for color as well as black-and-white sets. They use supersonic tones which control audio and video circuits at distances up to 50 feet.

In cabinet design, heavy reliance is being placed on 110-degree tubes which allow shallower cabinets. Chassis depths as short as seven inches for 17-in. tv sets will be pushed.

One firm expects good results from a receiver having an external picture tube on a swivel mount atop the cabinet. Some extras being offered by manufacturers are: earphone attachments, built-in indoor antennas and jacks for using the tv set as a second stereo channel. Another plus will be extended warranties on new sets.

Reflection of the confidence in increased sales volume may be seen in an increase of $3 million in tv tube sales from May to June of this year. Tv receiver sales were up 13,000 for the same period, and radio receiver sales were up 245,000.

Electronics for New Bomber

First photo of Sperry's bomb-nav system (ASQ-42) for Convair's supersonic USAF bomber, the B-58 Hustler, reveals a complete auxiliary inertial stable platform that can be turned on if primary system is damaged or malfunctions

A-Plane Awaits Engines

Electronics industry watches, waits as Air Force retrenches to concentrate on powerplant design and control, Navy works on nuclear seaplane. AEC plans to ground-test nuclear rocket propulsion concept this year. ARDC eyes controlled nuclear blasts as rocket pusher

RENEWED ACTIVITY in the nuclear aircraft propulsion program may come in 1960, according to recently released transcripts of the closed congressional hearings on Department of Defense budgets.

Pentagon officials stated that R&D funding would probably be increased in fiscal 1960. A special airbase for nuclear planes is under consideration.

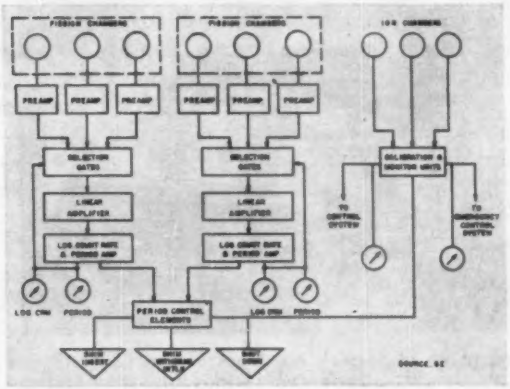
All references to Air Force target dates—when electronic systems would be required—are deleted from the record. However, the Navy has announced that its target is the 1964-65 period.

The Navy figures that by using nuclear engines in a big flying boat it would overcome radiation shielding weight problems. It would make an antisub, air early warning or cargo plane of almost unlimited range. With a gross weight of 1,100 tons, it could carry a payload of 335 tons.

The Navy is expected to spend some $21 million in the coming year—double its total nuclear plane spending for the last 12 years. The Air Force has planned $50 million and AEC, $75 million.

Originally, combined expenditures had been building up to $250 million for this year, the figure originally contemplated. Plans are now to request the $250 million in fiscal 1960, with another $100 million if an airbase is needed.

As previously reported (ELECTRONICS, p 15, Dec. 10, 1957), electronic R&D has concentrated on basic component radiation tolerance studies. The joint AEC-AF-Navy contracting office estimates that about three percent of funds, some $4 million, is devoted to electronics directly.



Multiple-chamber aircraft reactor instrumentation may look like this. Power levels would be computed by cruise control system

Since the primary goal is powerplant development, electronic systems design work is being done in propulsion control. Specific design of navigation, communication and countermeasures systems is not yet underway.

AEC lists two firms working on turbojet engines. GE has one in which air is heated directly in the reactor. United Aircraft plans to heat the air indirectly with a liquid metal heat exchanger.

On the other side of the nuclear propulsion fence, AEC and Air Research and Development Command are investigating several proposals for missile and space ship power.

Project Rover is designed to adapt nuclear power to ICBM or space ships. AEC is readying ground tests for this at Jackass Flats, Nevada.

If the tests later this year are successful, there would be an early decision to build a rocket powerplant. Flight would take another five or 10 years.

The test reactor, named KIWI-A, for the flightless bird, is reported to use an analog computer in its control system. It adjusts the power-propellant levels.

Next is Project Pluto, a nuclear powered ramjet using heated air as a propellant. Pluto is envisioned as a missile which could stay aloft indefinitely under remote control.

Project Snap contemplates auxiliary nuclear power for space satellites.

ARDC is eyeing atmospheric and spatial propulsion by a series of controlled nuclear explosions. General Dynamics got a $1 million contract to investigate the concept during fiscal 1959. Future contracts will depend on results obtained during 1959.

Other researchers are concentrating on ionic and plasma jet space ship drives, powered by electricity produced by nuclear reactors.

Republic Aviation just revealed that it has an operating heavy gas plasma engine. The plasma is compressed and accelerated by a cylindrical magnetic field. The firm has completed calculations for a Mars orbiting ship. It would weigh 35,000 pounds, carry 6,000 pounds of electronic gear.

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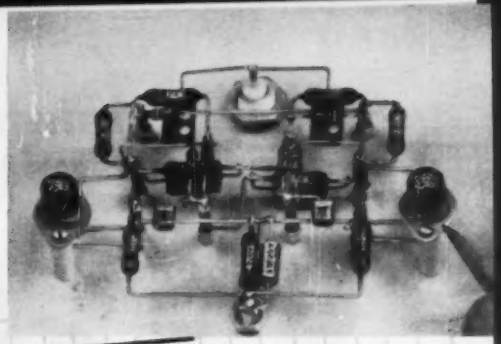

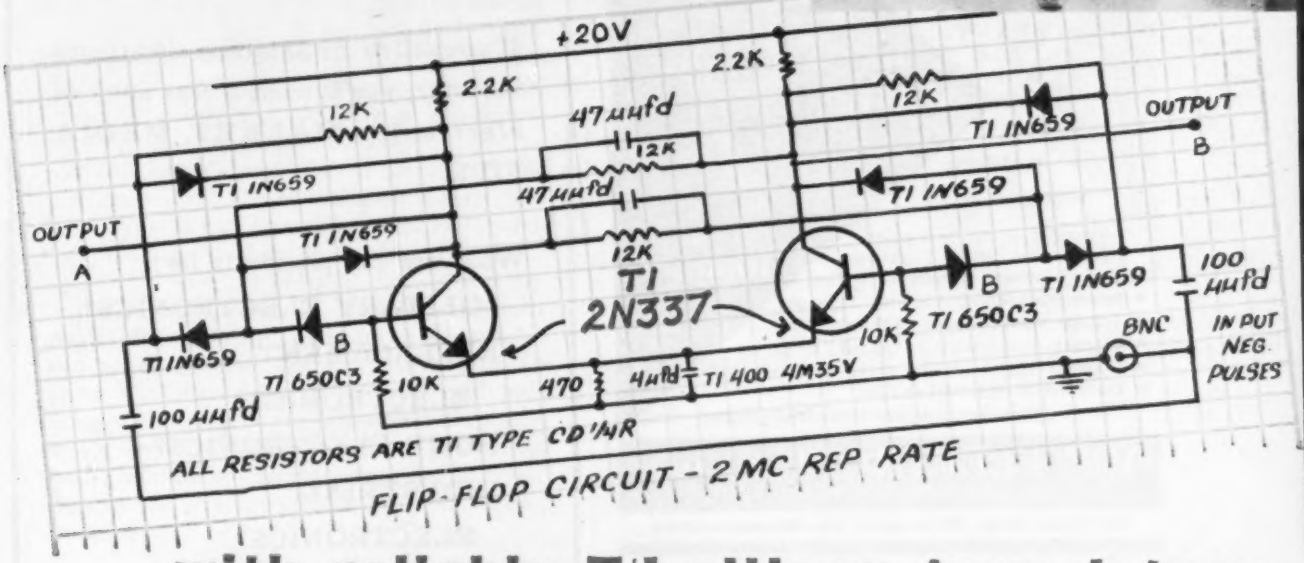

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design characteristics at 25° C ambient (except where advanced temperatures are indicated)

		test conditions		2N337 min	2N337 design center	2N337 max	2N338 min	2N338 design center	2N338 max	unit
I_{CBO}	Collector Cutoff Current‡	V_{CB} = 20V	I_E = 0	—	—	1	—	—	1	μA
	at 150°C‡	V_{CB} = 20V	I_E = 0	—	—	100	—	—	100	μA
BV_{CBO}	Breakdown Voltage	I_{CB} = 50μA	I_E = 0	45	—	—	45	—	—	V
BV_{EBO}	Breakdown Voltage	I_{EB} = 50μA	I_C = 0	1	—	—	1	—	—	V
h_{ib}	Input Impedance	V_{CB} = 20V	I_E = −1mA	30	50	80	30	50	80	Ohm
h_{ob}	Output Admittance	V_{CB} = 20V	I_E = −1mA	—	0.2	1	—	0.2	1	μmho
h_{rb}	Feedback Voltage Ratio	V_{CB} = 20V	I_E = −1mA	—	200	2000	—	300	2000	X10−6
h_{fb}	Current Transfer Ratio	V_{CB} = 20V	I_E = −1mA	0.95	0.985	—	0.975	0.99	—	—
h_{FE}	DC Beta	V_{CE} = 5V	I_C = 10mA	20	35	55	45	80	150	—
$f_{\alpha b}$	Frequency Cutoff	V_{CB} = 20V	I_E = −1mA	10	20	—	20	30	—	mc
C_{ob}	Collector Capacitance*	V_{CB} = 20V	I_E = −1mA	—	1.2	3	—	1.2	3	μμf
R_{cs}	Saturation Resistance†	I_B‡	I_C = 10mA	—	75	150	—	75	150	Ohm
h_{fe}	Current Transfer Ratio	V_{CB} = 20V	I_E = −1mA, f = 2.5mc	14	22	—	20	24	—	db
t_r	Rise time§			—	0.05	—	—	0.06	—	μsec
t_s	Storage Time			—	0.02	—	—	0.02	—	μsec
t_f	Fall time			—	0.08	—	—	0.14	—	μsec

* Measured at 1 mc † Common Emitter ‡ I_B = 1mA for 2N337, 0.5mA for 2N338 § Includes delay time (t_d)

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ENGINEERING REPORT

Cosmic Ray Study Demands New Gear

FAILURE OF EXPLORER V to orbit has held up the release of information about the instrument package and the IGY experiment it was designed to carry out. Spokesman for the IGY Committee and the State University of Iowa, where the instrument package was designed, told ELECTRONICS that it is now a matter of "policy" not to disclose details of instrumentation "prior to accomplishment" of an orbit. Explorer V failed to orbit on Aug. 24. Spokesmen decline to say whether the same experiment will be duplicated and say they are not at liberty to discuss the difference between the instrument package in Explorer IV (ELECTRONICS p 7, Aug. 29 and p 23, Aug. 8) and that in the ill-fated Explorer V. However, one source confirmed that the package held two Geiger tubes and two scintillation counters, that one of Explorer V's Geiger tubes had a lead shield three times the thickness of the 1/16-inch shield around an Explorer IV Geiger tube, and that the package held a scintillation counter with a smaller crystal than in the previous package for more accurate counting.

SPUTNIK that would simultaneously flash a light and transmit a radio signal is reportedly being studied by the Astronomical Council of the USSR Academy of Sciences. A Soviet publication says that light flashes would make it possible to determine the satellite's position at night with greater accuracy than by other methods. Produced in series, the flashes would reveal the sputnik's angular speed as well as its position. Simultaneous signal would give a time fix. (See also p 34).

IGY PROJECT ECLIPSE, a series of solar radiation studies, will be conducted during the total eclipse of the sun Oct. 12 in the Danger Islands area of the South Pacific. Six rockets, each providing about four minutes of usable data, will be fired just before, during, and just after the total eclipse period. Instruments include photon counters and ion chambers to measure soft X-rays, an ion chamber to measure hydrogen Lyman alpha radiation, and an aspect system consisting of visible light phototubes to determine rocket orientation in reference to sun and earth. F-m/f-m telemetering system will transmit data, which it is hoped will provide clues to the sun's effect on radio transmission and the weather. Operations will be conducted by Cooper Development Corp. which developed the rocket system.

SOVIET COSMIC RAY STUDIES are being pursued at a new Pamirs mountain scientific center in central Asia. Burgeoning "city" is equipped with a 70-ton electromagnet, a cloud chamber, an ionization hodoscope and automatic control equipment. When the apparatus is assembled, Soviet scientists will be able to detect the flux of cosmic particles over a wide area. Studies of nuclear interactions at energies of 50 billion electron volts are going on too. Recently begun: studies of particles of even a thousand times greater energy.

TECHNICAL DIGEST

• **Continuous getter** for high-temperature military and commercial tubes, highly effective in range between 200 C and 600 C, is applied to tube structure as CerAlloy paste coating containing cerium, aluminum and thorium, then sintered to base metal at 950 C in vacuum. Resulting coating is conductive, permitting use on inside of anode and on grid radiators. Production of high-reliability military tubes on entertainment-type sealoff machines is possibility with this getter.

• **Hidden flaws** in metal rods are detected even at ends, in eddy-current technique covered by AEC patent 2,817,060, just released for royalty-free licensing. Rod is moved through conventional r-f solenoid. Two small, flat pickup coils affixed to inside of solenoid at opposite ends of a diameter give zero voltage when specimen is flawless, even when rod enters or leaves, because they are connected in opposition. Flaw distorts magnetic field and induces different voltage in nearer pickup coil. Difference voltage is amplified and recorded. Higher frequency increases sensitivity to defects near surface.

• **Sea force generator,** developed by Muirhead for predicting performance of ship stabilizers, uses easily changed wave-shaped cam to actuate rolling table through synchro, amplifier and servomotor. Analog computer on table simulates actual stabilizing means and acts also on servomotor to simulate damping action of stabilizer. Optimum design can thus be achieved without waiting for various required weather conditions and without expense of tests on actual ships.

• **Reading machines** can be made more error-free by adding logic matrices that sense impossible character groups. Logic costs much more than noise cleanup by clipping and pulse discrimination, hence cost of error elimination must be balanced against cost of error when designing flying-spot scanner systems.

Tones May Control Satellites

PROTOTYPE electronic gage, successfully tested in the laboratory by Lockheed, may aid in space vehicle control, help predict satellite life and supply important information about the atmosphere. The device was described by A. J. Dessler at a recent American Astronautical Society meeting at Stanford University.

The instrument is sensitive enough to operate at 300 miles altitude and may even be good to 400 miles.

The device operates on a simple principle. It is mounted in the forward part of a satellite where a small hole lets atmospheric gas molecules into the instrument. As the satellite speeds through space, the stream of air rushing through the hole is chopped by a system of blades. The chopped air hits a microphone producing a tone.

If the satellite is properly oriented with respect to its direction of motion, the uniform pulses of air from the chopper produce a steady tone. Pitching and yawing result in an uneven flow of chopped air with interruption or loss of the signal. When this occurs, the device actuates controls to reposition the vehicle to the proper attitude.

Accurate and continuous measurement of atmospheric density by the instrument is regarded as equally significant. Air density affects the intensity of the tone produced by the air stream as it strikes the microphone.

Information on density will enable scientists to more accurately predict lifetimes of space vehicles subjected to atmospheric drag. Presently such information is accumulated only from averaging data gathered from tracking satellites over many orbits.

The difficulty of the averaging problem is indicated by rocket data now available which show that variations of more than a factor of 10 have been recorded at 125 miles altitude depending on the time and place of measurement.

The indicator would yield a continuous reading of density including variations encountered at various altitudes, latitudes and local time. Thus one successful satellite orbit should yield a detailed description of the atmospheric density profile and its variations.

Computer Cracks Oil

General-purpose digital computer is measuring 160 variables in Esso catalytic cracking unit. Twenty-seven of the variables are computed operating guides, such as catalyst circulation rate, carbon buring rate, material balance. Leeds & Northrup system now aids operators in process performance but in future, loop may be closed for completely automatic processing

MEETINGS AHEAD

Sept. 10-12: Tube Techniques, Fourth National Conf., Advisory Group on Electron Tubes, OSD, Western Union Auditorium, N.Y.C.

Sept. 12-13: Communications Conf., IRE, Sheraton Montrose Hotel, Cedar Rapids, Iowa.

Sept. 18-19: National Assoc. of Broadcasters, Fall Conf., Buena Vista Hotel, Biloxi, Miss.

Sept. 22-24: National Symposium on Telemetering, Americana Hotel, Miami Beach, and Patrick Air Force Base (Sept. 25).

Sept. 24-25: Industrial Electronics, Seventh Annual Conf., IRE, AIEE, Rackham Memorial, Detroit, Mich.

Sept. 25: Engineering Problems in Space Medicine, IRE Medical Electronics, Univ. of Penn., Phila., Pa.

Sept. 26-27: Broadcast Transmission Systems, Annual Symposium, IRE Prof. Group, Willard Hotel, Wash., D.C.

Sept. 29—Oct. 3: Audio Engineering Society, 10th Annual Conf., Hotel New Yorker, N.Y.C.

Oct. 1-2: Radio-Interference Reduction, U.S. Army Signal Research & Devel. Labs, IRE, Armour Research Foundation, Chicago, Ill.

Oct. 2-4: Upper Midwest Trade Exposition, Electronic Wholesalers Assoc., Minneapolis Municipal Auditorium, Minn.

Oct. 6-8: Symposium on Extended Range and Space Communications, IRE and George Washington Univ., Lisner Auditorium, Wash., D.C.

Oct. 8-10: IRE Canadian Convention and Exposition, Electronics and Nucleonics, Exhibition Park, Toronto, Canada.

Oct. 13-15: National Electronics Conf., 14th Annual, Hotel Sherman, Chicago.

Oct. 20-21: USA National Committee, URSI Fall Meeting, Penn State Univ., University Park, Pa.

Oct. 20-21: Aero Communications Symposium, Fourth National, PGSC, Hotel Utica, Utica, New York.

Oct. 29-30: Fifth Annual Computer Applications Symposium sponsored by Armour Research Foundation, Morrison Hotel, Chicago.

Oct. 30-31, Nov. 1: Electron Devices Meeting, PGED, Shoreham Hotel, Wash., D. C.

Researcher sitting at his lab bench uses hand press to make . . .

Quick Piezoelectrics

NRL adapts ceramic cold-curing, finds it a simple method of making barium titanate units

FAST, INEXPENSIVE method of making barium titanate piezoelectric ceramics has been developed at Naval Research Labs. The ceramics are suitable for microphones, sound detectors, phonograph pickups and other noncritical or commercial applications.

In practical tests, the transducers picked up watch ticks as clearly as conventional barium titanate units. Ultrasonic firms are interested in pursuing commercial development, reports A. D. Burbage, who, with M. J. Riley, worked out the process.

Cold-curing, the method used, has been employed with other ceramics, but not with barium titanate, they report. The ceramic, a popular ultrasonic transducer, can be polarized during or after solidification.

At the lab, a commercial grade of barium titanate powder was mixed with a binder. The mixture was pressed in a mold in a hand press at low temperature while a polarizing voltage was applied. About 90 minutes is all it takes.

Several binders may be used. Sodium silicate in a soluble form gave good results. Carnauba wax is also suitable, added as dry powder or melted and stirred into the ceramic powder.

For the wax-titanate mixture, the mold is heated to 150 C in the press while polarizing voltage is applied. The sodium silicate-barium titanate mixture is heated to 180 C, at 10,000 psi pressure, and polarized. Or, 100 C will do if the pressure is maintained until the mold cools.

Disks were also made without pressure. After aging three months, these showed a greater drop in dielectric constant. The drop was greatest for the sodium silicate mixture.

Piezoelectric efficiency is not as high as with sintered barium titanate. The cold-cured ceramics, however, are mechanically rugged and as hard as the sintered units, though no basic studies of best ceramic particle size and binder were made.

Cells Spark New Markets

RESISTOR and rectifier makers may profit from a consumer applications campaign being waged by manufacturers of small, rechargeable batteries, widely used in airborne and mobile military electronic gear.

Miniature rechargeable batteries have been introduced in portable transistor radios, dictating machines, flashlights and photographic lights, as well as hearing aids. When an a-c charging source is used, the charger contains a rectifier and dropping resistor; for d-c, a dropping resistor.

Battery manufacturers are promoting wider use by electrical appliance makers. Selling points are the convenience of plugging in the appliance for recharging only when it is not in use, portability, long battery life.

Among the possibilities are electric shavers, blankets, heating pads, bottle and food warmers, record players, portable tv, all being made in quantities of two million, or more, a year. Battery-powered shavers, no larger than conventional types, are being made in Europe.

One firm also reports interest shown by an auto manufacturer, for use with such accessories as combination auto-portable radios. The Army has been trying out rechargeable batteries with jeep-borne electronic equipment.

Ruby Maser for New Telescope

ARRANGEMENTS are being made to incorporate a ruby maser in the 85-foot radio telescope the University of Michigan is constructing. UM reports the maser is capable of discerning radiation from otherwise invisible stars, thousands of light years away.

University scientists who observed maser action in rubies last December believe ruby is the most suitable material for this application. Synthetic rubies are available at low cost in quantities.

Development work is underway to package the maser in units the size of a small filing cabinet. Ultimately, it may be more compact. Applications in addition to astronomy include military surveillance devices, longer-distance tv reception, better microwave communication in the 1 kmc to 20 kmc range.

The maser will detect radio emission from any object warmer than itself—which means practically anything since the ruby is kept at near absolute zero by liquid helium. Reduction of atomic noise in the crystal permits the device to amplify low-level signals.

NATO Gets Scatter Link

First of organization's four proposed communications sections is operating in Norway

PARIS—First section of NATO's new "forward scatter" communications system is now operating in Norway. An American general in Oslo talked by telephone to a Norwegian general 500 miles away in Bode, north of the Arctic Circle, to open the link.

Norwegian communications section is first step in a program which will connect NATO commands from northern Norway to eastern Turkey. Use of forward scatter system, NATO says, promises a military communications system which is "nearly jamproof."

Technique involves use of uhf radio signals transmitted at much greater power than used by conventional uhf sets. Signals are beamed at a preselected tropospheric or ionospheric layer which reflects small portions of the radio energy back to earth at predetermined points.

System is being installed throughout NATO area under the supervision of International Standard Electric Corp., New York, N. Y., and Hycon Eastern, Inc., Cambridge, Mass. These two firms were given an $8.5 million contract by NATO in May, 1957.

Norway was selected for the first link partly because its geographic configuration made possible the operation of a complete link within its borders. This was preferable to starting work initially in several countries at once. Four stations are used in the Norwegian set-up, at Trondheim, Mosjoen, Bode and Oslo, the latter city being the headquarters of allied forces in northern Europe.

NATO has not revealed where its second link will be added, nor has it fixed a completion date or the cost for the entire system. But NATO has said that under the new system only 250 operators will be needed for all of Europe. Using the techniques of tropospheric scatter, messages can be transmitted up to 250 miles. If need be, it is understood that the system can use ionospheric techniques to transmit messages up to 1,300 miles.

MILITARY ELECTRONICS

• **To prevent** heat seeking missiles from blowing a harmless white cloud to bits while allowing an enemy plane to go by unmolested, ARDC has sent up the first of 11 balloons to measure the relative intensities of infrared and ultraviolet rays from the ground, clouds and flying vehicles. It is hoped some pattern can be discovered for various altitudes, seasons and positions of the sun that may be applied universally.

Though assigned to Wright Air Development Center, ARDC's tests are being carried out at Holloman Air Force Base, New Mexico. The balloon equipment, valued at $100,000, was designed by scientists from the University of Denver Research Institute under a $350,000 contract with WADC. Eight man-years of work went into preparation for the flights.

Carrying a 500-lb gondola, each balloon measures 93 ft across when it reaches 80,000 ft altitude. A scanning device, consisting of a reflecting mirror-scope that makes a 180-degree turn, gathers information on infrared and ultraviolet rays and telemeters it to the ground. Collected on tape, the final result —four million items of information —is translated by a Datatron.

• **Dynasoar** design and development work in the Martin team will be split up in the following way:

Bell Aircraft-airplane portion; Bendix – communications, telemetry, hydraulics, electrical power conversion, cabling and electric connectors; Goodyear—crew escape-capsule, radar, radome materials; Minneapolis-Honeywell – guidance and navigation; and American Machine & Foundry—ground handling and launching. Martin will establish configuration and design of rocket boosters, carry out aerodynamic program for complete vehicle and assemble a full-scale mockup.

CONTRACTS AWARDED

Bell Aircraft gets a $500,000 contract with Air Materiel Command for design, development, fabrication and testing of HIPERNAS II, high-performance-inertial-navigator. System will be used in Army surveillance drones, USAF satellite and space vehicle programs.

A. C. Spark Plug is awarded a $1,162,658 contract with AMC for product improvement of inertial floated gyros for use in the Mace and Thor missiles.

Lockheed receives a $22 million contract with BuAer for 26 new P2V-7 Neptune antisubmarine airplanes and equipment. Neptune carries more than a ton and a half of electronic detection equipment.

Sperry receives a $1,018,215 contract with AMC for APW-22 command guidance transponder sets, test sets, spare parts and reports for XQ-4A drones (Electronics,

p 26, April 18). Sperry also gets a $1,355,286 contract with AMC for controls, amplifiers, compensators, transmitters, spare parts, ground support and data for support of Army aircraft and USAF T-33A aircraft.

Collins will sell h-f ssb radio sets, AN/ARC-58, to be used in the B-52G and KC-135A, under a $7,404,006 contract with AMC.

Firestone Tire & Rubber will supply Army Ordnance District, Los Angeles, with Corporal surface-to-surface missiles under a $2,423,653 contract.

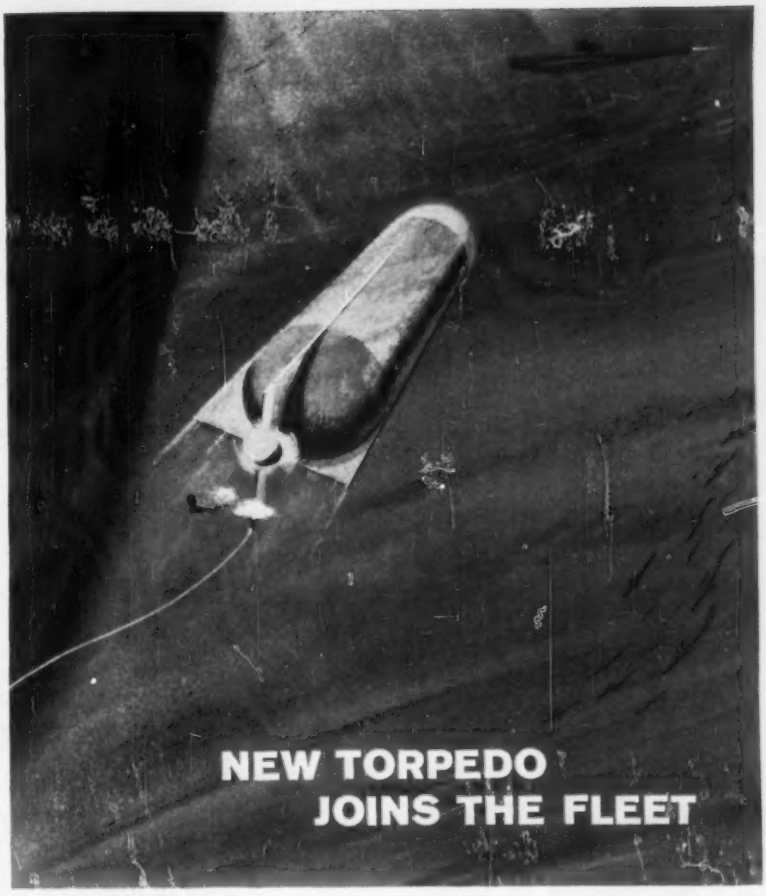
Curtiss-Wright's Electronics div. has a $1,950,853 contract with Ogden Air Materiel Area for maintenance of flight simulators.

Sylvania gets three Army Signal Supply Agency contracts for mobile digital computer, Mobidic: $1,413,608 for one service test model, Mobidic "B", $1,694,225 for one Mobidic "D", and $500,000 for a design plan for Mobidic "C." Sylvania also gets a $3 million prime contract with Air Materiel Command for production of Doppler radar navigation equipment, AN/APN-81.

Motorola gets a $4,186,840 contract with Army Signal Corps for "prototype electronic warfare systems."

Bendix will sell vertical gyros, MD-1, and rate gyros, MC-1, to be used in fighters, bombers and tankers to AMC under a $1,793,697 contract; also vertical speed/altitude indicators for use on the F-105 and F-106 under a $1,954,329 contract. Bendix sells two radar sets, AN/FPS-30, to Rome AF Depot for $2,000,901.

Westinghouse receives an $8 million plus contract with Navy for production of an advanced air-search radar for use on cruisers, aircraft carriers and other surface ships. Westinghouse says the new radar employs "a revolutionary electronic circuit technique" that increases range with less power.



VITRO'S weapon systems capability is dramatically demonstrated in the new Mark 39, a wire-guided torpedo which the U. S. Navy has just added to our growing arsenal of underwater weapons.

Spider-like, the torpedo pays out a wire as it drives through the water. Over this wire combat crews send electrical signals that guide it to its target, regardless of course changes or other evasive actions. Swimming deep, Mark 39 leaves no telltale wake, generates no pulsations for detection, relentlessly closes on its target regardless of defensive maneuvers.

The wire technology, the torpedo, and the fire control system were developed into a weapon system for the Navy by Vitro Laboratories, a division of Vitro Corporation of America.

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NEW PRODUCTS

Sweep Oscillator highly stable

KAY ELECTRIC CO., Maple Ave., Pine Brook, N. J. The Rada-Sweep 300 fundamental frequency sweeping oscillator has ten switched bands with fixed center frequencies set to customer order. It is designed for sweeping radar or other i-f's and networks between 1 mc and 350 mc center frequencies; it is extremely stable, has low harmonic content and is completely free from spurious signals. A single switch provides sweep and markers simultaneously. **Circle 50 on Reader Service Card.**

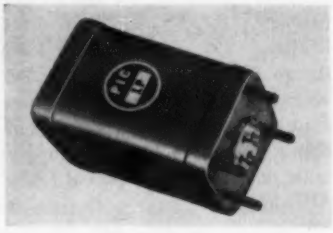
Servo Motor high stall torque

JOHN OSTER MFG. CO., 1 Main St., Racine, Wisc. A new size 11 servo motor develops 1 oz in. stall torque in a standard size 11 BuOrd frame

instead of the usual 0.6 oz in. Design techniques include special winding and use of high temperature materials and lubricants. Type 11-5101-42 is a 115 v 2 phase servo motor with control phase rated at 115/57.5 v. Power input is 6.2 w per phase at stall; operating temperature range, −54 C to +71 C. **Circle 51 on Reader Service Card.**

Electrical Filter Chebishev type

POLYPHASE INSTRUMENT CO., East Fourth St., Bridgeport, Montgomery Co., Pa., offers Chebishev type high pass and low pass electrical wave filters with cutoff frequencies up to 100 kc. They feature high attenuation, low insertion loss, and excellent stability over a wide temperature range. Filters are available in epoxy molded, or hermetically sealed metal construction to conform to particular design requirements, for commercial or military applications. **Circle 52 on Reader Service Card.**



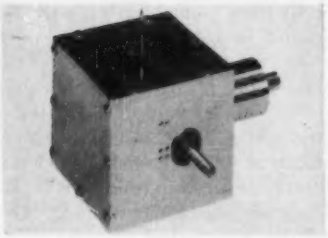
Oscillator subcarrier type

DATRAN ELECTRONICS, 1836 Rosecrans Ave., Manhattan Beach, Calif. Model 0300 inductance controlled subcarrier oscillator can be tuned to any of the 18 RDB telemetering bands covering the range from 400 cps to 70,000 cps. Output frequency is varied from its tuned center point by any inductance type transducer having two

output leads. Output voltage level can be adjusted by a miniature, multiturn pot. The plug-in assembly is both mechanically and electrically compatible with the Bendix TJS-2 adapter, thereby increasing the number of available channels in customers' existing telemetering systems. **Circle 53 on Reader Service Card.**

Crystal Filter high performance

HUGHES PRODUCTS, International Airport Station, Los Angeles 45, Calif. A new line of precision crystal filters features a unique advanced design permitting center frequencies of 30 kc to 30 mc and fractional bandwidths of 0.01 percent to 6 percent. Advantages include high frequency filtering, high selectivity, low passband ripple, low insertion loss, small size and weight, temperature stability, and excellent shock and vibration stability. **Circle 54 on Reader Service Card.**

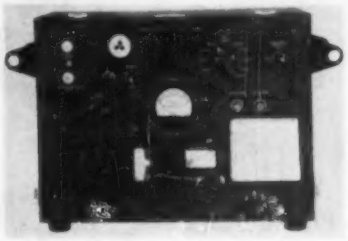


Ring Integrator precision device

American Meter Co., Inc., Box 306, Garland, Texas. The ring integrator is a precision variable speed mechanism which employs a movable ring held between a driving disk and a driven drum. The movable ring can be accurately controlled or repositioned by a force of less than 0.02 oz as the output shaft load varies from 0 to 2 oz in. Output shaft speeds of 0 to 2.75 times the input speed can be obtained. The device is useful in instrumentation and control applications. **Circle 55 on Reader Service Card.**

Capacitance Bridge priced at $2,175

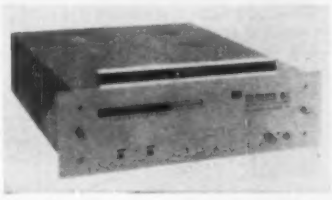
General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass. Type P-582 is a 3-terminal capacitance bridge designed to calibrate capacitive fuel-gage testers. It is a self-contained bridge system which



includes a 400-cycle oscillator and a sensitive null indicator. Capacitance range is 5 $\mu\mu$f to 0.011 μf with an accuracy of ± 0.1 percent over most of the range. Dissipation factor range is 0 to 0.11 with an accuracy of ± 2 percent of reading ± 0.0002. **Circle 56 on Reader Service Card.**

Converter voltages to digits

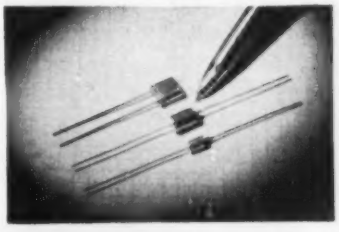
Packard-Bell Computer Corp., 1905 S. Armacost Ave., Los Angeles 25, Calif. Model M-1 incremental Multiverter converts voltages to digits in a single high information channel at rates as high as 200,000 conversions per sec. The M-1 will literally follow a single function on an incremental basis. A digital number is always present in the output register, with the change being entered every 5 μsec (to accuracies of 0.01 percent). The counter used accepts three types of input: -1, $+1$, and 0 (or no change). The Multiverter is completely transistorized, small in size, and low in



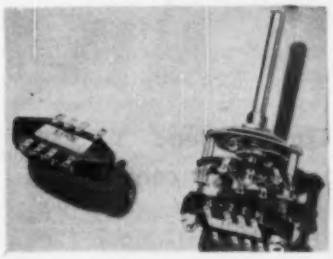
power requirements. **Circle 57 on Reader Service Card.**

Tantalum Capacitor in smaller sizes

Fansteel Metallurgical Corp., North Chicago, Ill. S-T-A type solid tantalum capacitor has been redesigned to smaller sizes. The illustration shows a new capacitor of the 100 series, rated at 1.0 μf, 35



wvdc, contrasted with two earlier models of the same rating. Length of the new capacitor (excluding leads) is 0.250 in., diameter is 0.175 in. Characteristics have also been improved. Details are given in temporary bulletin 6.112-2. **Circle 58 on Reader Service Card.**



Decade Resistors four-in-one

International Resistance Co., Hycor Division, 12970 Bradley Ave., Sylmar, Calif. The new precision decade resistor consists of four precision resistors solidly encapsulated in a specially designed block which conveniently mounts on the tie rods of standard wafer switches. By using one, two, three, or four in each decade, any value from one to ten may be obtained. By using two, three or four of the decades, almost any resistance value can be obtained to ± 0.1 percent if necessary. The blocks can be mounted with short leads in the chassis of the equipment being

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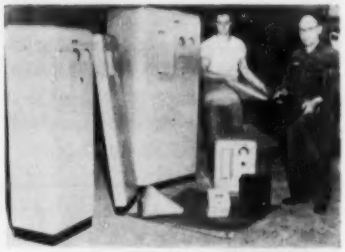
tested and adjusted while in position, thus allowing the engineer to change the value of the resistance as needed, without stray capacitance and pickup associated with conventional decade boxes and leads. **Circle 59 on Reader Service Card.**

Phase Meter direct reading

DYTRONICS, P.O. Box 3676, Beechwold Station, Columbus 14, Ohio. Model 210 phase meter is designed for accurate phase measurement over the 10 cps to 30 kc frequency range. Features include direct reading in degrees from a large circular dial, no ambiguity, and high input impedances and high sensitivity for both the input and reference signals. Phase increments of 0.1 deg can be measured directly. **Circle 60 on Reader Service Card.**

Capacitor polystyrene type

CORSON ELECTRIC MFG. CORP., 540 39th St., Union City, N. J., announces a precisely adjustable 1-μf polystyrene capacitor. The unit may be trimmed ± 1.5 percent from nominal value, with the degree of accuracy in capacity setting being dependent only on the limitations of the measuring equipment. Rated voltage is 200 v d-c, test voltage 400 v d-c. Dissipation factor at 1,000 cps is 0.01-0.05 percent. Insulation resistance is 10^6 megohm microfarads at 25 C. Operating temperature range is +1 C to +65 C. Temperature coefficient is -100 parts per million per deg C. Retrace is approximately 0.2 percent. Soakage is 0.01-0.02 percent. **Circle 61 on Reader Service Card.**



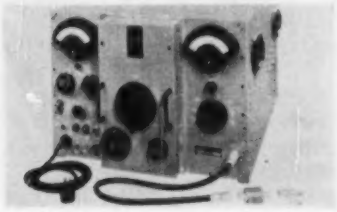
Plastic Housings light and strong

FISCHER & PORTER CO., 739 JACKSONVILLE Road, Hatboro, Pa., has available facilities for making fiber glass reinforced, corrosion-proof, plastic cabinets and housings. They are ideal for housing components or assemblies used in the chemical and allied industries where high corrosion resistance is required. Information is available on plastic housings tailor-made to your specifications. **Circle 62 on Reader Service Card.**

Camera Head for remote control

THE HOUSTON FEARLESS CORP., 11859 W. Olympic Blvd., Los An-

geles 64, Calif. Model RCH-3 camera head offers a practical, economical means for tilting and rotating small itv cameras by remote control. Mounted on a light-duty tripod or other support, the head will handle cameras up to 20 lb. Powered by two Bodine motors, it will tilt the camera 45 deg up or down and rotate 370 deg. It can also be mounted vertically for operation of the camera in a vertical position. Speed of operation is 2 deg per sec in elevation, 3½ deg per sec in azimuth. The control unit can be located at a considerable distance from the head. **Circle 63 on Reader Service Card.**



Signal Generator high power

BJ Electronics, Borg-Warner Corp., 3300 Newport Blvd., Santa Ana, Calif. Model 30A high power standard signal generator is useful in measuring antenna radiation patterns in the uhf-vhf region. The general lab instrument covers the range of 40.7 to 400 mc with a nominal output power of 10.0 v with 15.0 v available under maximum power conditions. It can supply stable high power signals useful in slotted line applications, filter design and testing. **Circle 64 on Reader Service Card.**

VHF Preamplifier broadband unit

Haller, Raymond, & Brown, Inc., Circleville Road, State College, Pa., has developed a broadband vhf preamplifier for crystal-video detectors which has a gain of about 45 db from 50 mc to 300 mc. Average noise figure is about 7 db. The measured tangential sensitivity of a typical vhf crystal-video detector is about −50 dbm for a video band-

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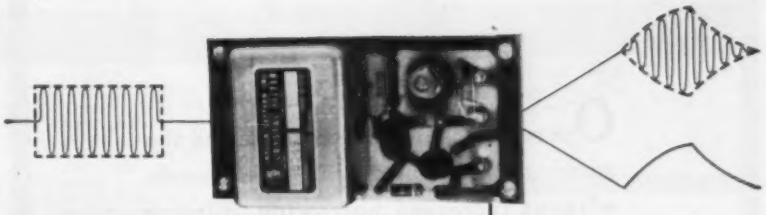
Pulse Doppler Radar uses

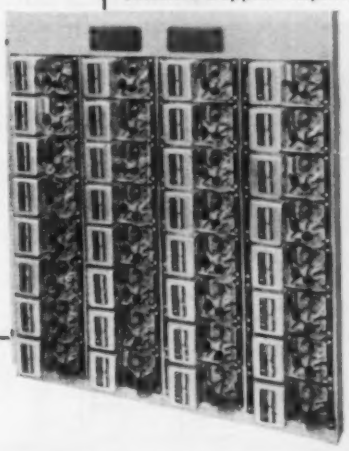
HYCON EASTERN CRYSTAL FILTERS



Hycon Eastern Selective Doppler Amplifier . . . shown ½ size

Section of Doppler Receiver showing banks of Hycon Eastern Selective Doppler Amplifiers

Millstone Hill 84' Radar Antenna



The problems in long range radar for today's ballistic missile defense systems require solutions that are unique yet reliable. Meeting these criteria is the Lincoln Laboratory's "Millstone Hill System". Working closely with Lincoln Laboratory on the transient response problems, Hycon Eastern provided "comb set" crystal filters and associated circuitry forming complete networks termed Selective Doppler Amplifiers.

Hycon Eastern offers a unique customer service by assuming total responsibility for exact pulse output. All crystal filters are tested and aligned under simulated operating conditions, using a pulsed input. Transistor amplification, active impedance transformation, and detector circuitry are provided for complete compatibility with the total system. These integrated units are delivered ready for immediate use.

Hycon Eastern is presently supplying crystal filter banks for airborne intercept, bomber defense, shipborne and land based detection and tracking systems. Write for Crystal Filter Bulletin.

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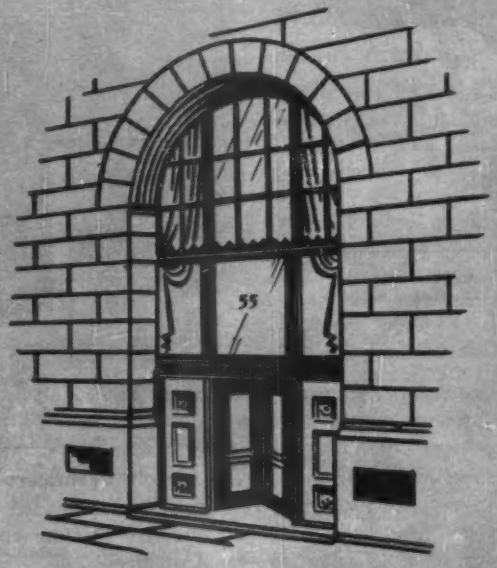

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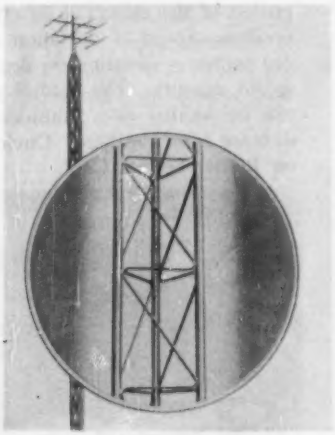
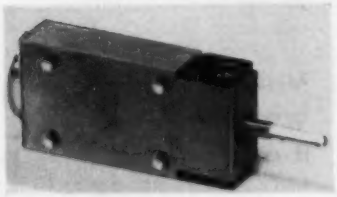
width of 1 mc. The average tangential sensitivity of this same detector employing the vhf preamplifier is approximately −88 dbm. Packaged weight, excluding power supply, is less than 4 lb. Power input of 70 w is required. **Circle 65 on Reader Service Card.**



Tv Tower
heavy-duty

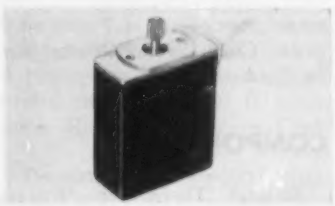
ROHN MFG. CO., 116 Limestone, Bellevue, Peoria, Ill., has added a new general-purpose communication and heavy-duty tv tower to its line. The No. 25 tower features a 12¼ in. equilateral triangular design, utilizes special 1¼ in. extra-heavy-gage tubing for side rails and zig-zag solid steel cross-bracing. It can be utilized self-supporting to 50 ft heights or guyed up to 150 ft. **Circle 66 on Reader Service Card.**



Flat Motor
miniature unit

GLOBE INDUSTRIES, INC., 1784 Stanley Ave., Dayton 4, Ohio. Type VS is a permanent magnet, ball-bearing motor only ⅞ in. thick by

$\frac{13}{16}$ in. wide by $1\frac{7}{8}$ in. long. It is designed to meet the requirements of various MIL specs on humidity, salt spray, shock, vibration, fungus, etc. Although it weighs only 1.7 oz the rugged unit can produce starting torques up to 1.0 in. oz. Bulletin No. 121 contains complete information. **Circle 67 on Reader Service Card.**



P-M Motor
rectangular type

BARBER-COLMAN CO., Rockford, Ill. The size of a pack of matches, a new p-m motor is particularly suited for applications where space is a critical factor. It is designed to MIL-M-8609. The unit contains precision double shielded bearings and Alnico magnets. A typical 27 v d-c motor is rated at 13 millihorsepower at 10,300 rpm and 0.8 ampere current, continuous duty. Ambient temperature range is −65 F to +200 F. Weight is 0.40 lb with explosion proof enclosure. **Circle 68 on Reader Service Card.**

Electric Printer
for readout use

TALLER & COOPER, INC., 75 Front St., Brooklyn 1, N. Y. A new electric printer accepts parallel or serial input and prints from six to nine columns of digits in one or two copies. Output rate from parallel input is three lines per sec; from serial input, four digits per sec. The compact device accepting more than 100 ft of paper three in. wide in one loading, has 12 characters available on each printing wheel, comprising 0 through 9 (or alphanumeric), blank and decimal point. Applications include readout from digital converters, digital voltmeters or computers. **Circle 69 on Reader Service Card.**

- Nine overlapping voltage ranges—from 10 mv to 100 v full scale in 3-to-1 steps.
- Large 6½-inch easy-to-read meter.
- High input impedance—10 megohms with LOW-CAP probe permits measurement in circuits sensitive to loading.
- Frequency response 20 cps to 500 Kc.
- Power-line frequency range from 50 to 400 cps.
- Probe cable shielded throughout its length—eliminates pickup from stray fields.
- May be used as preamplifier—38-db maximum gain on 10-millivolt range with less than 0.5% distortion.
- Die-cast aluminum case—provides good shielding, withstands hard usage.

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- Over-all microammeter accuracy on X.01 range ±5% of full scale; accuracy on all other ranges ±4% of full scale.
- Voltage drop for full-scale deflection only 0.5 volt.
- As a voltmeter, the WV-84B is especially suited for measurements in circuits where circuit loading is a critical factor.
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Literature of

MATERIALS

Polyester Compound. Isochem Resins Corp., 221 Oak St., Providence 9, R. I. Data bulletin DB-131-882 describes Isogel 131, a 100-percent reactive polyester compound designed primarily as a low cost coating compound for electronic components and other small parts. **Circle 75 on Reader Service Card.**

COMPONENTS

Bimetal Thermostats. Stevens Mfg. Co., Inc., P. O. Box 1007, Mansfield, Ohio. Bulletin 6100 covers the new line of type MX snap-acting bimetal disk thermostats designed for use in missiles, aircraft and electronic applications requiring close temperature control. **Circle 76 on Reader Service Card.**

Glass Mercury Switches. Gordos Corp., 250 Glenwood Ave., Bloomfield, N. J. A new catalog covers a line of glass mercury switches with capacity ranging from 5 ma to 45 amperes. **Circle 77 on Reader Service Card.**

Silicon Rectifier Stack Assemblies. Fansteel Metallurgical Corp., North Chicago, Ill. Bulletin 6.310 describes silicon rectifier stack assemblies which consist of type 1A, 500-ma silicon rectifiers permanently attached to p-c boards for easy mounting into a product. **Circle 78 on Reader Service Card.**

Wire-Wound Resistors. Cinema Engineering, 1100 Chestnut St., Burbank, Calif., displays its entire line of precision wire-wound resistors in 20-page catalog 14RC. Nearly 100 types are covered. **Circle 79 on Reader Service Card.**

EQUIPMENT

Engineering Report. Servo-Tek Products Co., Inc., 1086 Goffle Rd., Hawthorne, N. J. A 12-page engineering report describes test procedures and test equipment used

the Week

in determining stability, linearity and other characteristics of d-c tachometer generators. **Circle 80 on Reader Service Card.**

High Rate Tester. Allegany Instrument Co., Inc., 1091 Wills Mountain, Cumberland, Md. A 4-page folder describes and illustrates model 625B high rate tester which consists of separate loading and recording sections that can be located as much as 50 ft apart. **Circle 81 on Reader Service Card.**

Transistor Characteristic Plotter. Dunn Engineering Associates, Inc., 225 O'Brien Highway, Cambridge 41, Mass. Features, applications and specifications of the model 341 power transistor characteristic plotter are contained in a recent bulletin. **Circle 82 on Reader Service Card.**

Universal Recorder. The Hays Corp., Michigan City, Ind., has a bulletin-specification sheet package of literature on the company's universal electronic recorder. Included are details on two types of receiver units (slidewire and differential transformer types), direct pressure and temperature receivers, universal amplifier, integrator and accessories. **Circle 83 on Reader Service Card.**

FACILITIES

Connector Testing. The Deutsch Co., 7000 Avalon Blvd., Los Angeles 3, Calif., offers a 29-page test report detailing the laboratory testing of the company's miniature electrical connectors. It describes tests for electrical, environmental and physical characteristics. **Circle 84 on Reader Service Card.**

Snap-Action Switches. Micro Switch, a division of Minneapolis-Honeywell Regulator, Freeport, Ill. *Micro Tips* No. 25 contains ideas submitted by plant engineers and electricians showing how they've used snap-action switches to increase production efficiency. **Circle 85 on Reader Service Card.**

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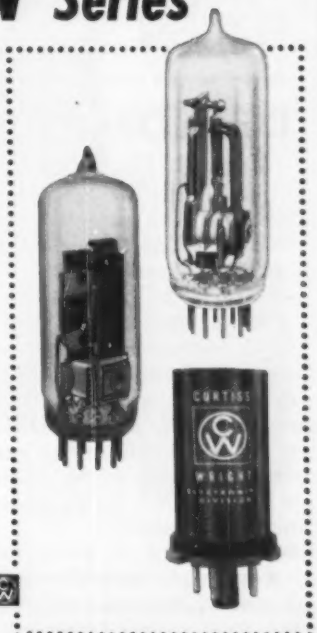

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CIRCLE 16 READERS SERVICE CARD

FOREIGN BUSINESS

Reds Plan Sputnik Tv-Relay

Work underway to put electronic foot in the door of 2.2 billion of the world's people

SOVIET SATELLITE for relaying tv broadcasts appears to be in the planning stages, with scientists anxious to carry out preliminary tests of both the rocket vehicle and the broadcast relay apparatus.

Such a scheme was recently described by scientist Druzhkin and engineer Sorin in the magazine, "Knowledge Is Strength." They envision for Moscow a future audience taking in Europe, Asia, Africa and Australia.

Decision to push ahead with such a plan was made last January, they say, by the tv section of the USSR Scientific and Technical Society of Radio Technology and Electrical Communications. The group at that time endorsed a study of theoretical and practical problems connected with such a launching.

"There is every reason to expect," the scientists say, "that this launching can be readied and carried out now."

Tv satellite would give the Russians an electronic foot in the door of countries inhabited by some 2.2 billion persons. It would complicate the task of policing the international airwaves, proposed last month to the UN by President Eisenhower. The President called for a UN monitoring system as part of a six-point plan for ending Mideast tensions. But his speech and other General Assembly proceedings broadcast by the Voice of America were jammed by 2,000 to 2,500 transmitters in the Soviet Union and other Communist countries.

Druzhkin and Sorin say a relay satellite should be fired to a height of 36,000 km (22,350 miles), at which it would move at an angle speed equal to that of the earth's rotation around its axis; it would, in effect, hang over a given spot on the earth's surface.

They estimate 2 kw are needed to power the transmitting apparatus. They propose to use solar batteries at first and switch later to small nuclear reactors.

Construction of ground and satellite instrumentation and the launching of the satellite's rocket pose complicated problems, the scientists say. But they add that they are "becoming quite realizable and within the means of Soviet scientific and industrial organizations."

Article by Druzhkin and Sorin suggests that Russia can get mileage out of her propaganda rubles through such a scheme than through conventional broadcast techniques. The cost of such a project, they say, would be several times less than the building of thousands of tv centers, and underground and overland relay stations, even if a new tv satellite must be launched every year.

Steady reception would be assured, they say, throughout the eastern hemisphere from the 82nd parallel north to the 82nd parallel south, possibly even in higher latitudes, and also in the western hemisphere.

DEVELOPMENTS ABROAD

• **Peiping** radio reports Red China's first electronic digital computer has been completed by the Institute of the Chinese Academy of Sciences, with technical assistance from the Soviet Union. The radio said the computer contains 4,000 resistors and about 800 electron tubes. The Institute is said to be planning to use the machine for short-range weather forecasts, in production of nonferrous metals, analysis of stress in the designing of dams, atomic energy problems and other projects.

• **Poland** plans to double her production of electronic instruments and counters used in nuclear research and measurement. Last year 450 units valued at $400,000 were produced. This year an all-out effort is expected to yield at least $750,000 worth of instruments which would otherwise be imported. Polish Nuclear Research Institute at Swierk is said to have made recent refinements in the design and methods of manufacturing counters and other gear.

• **Mexico's** first Exposition of Electronics and Electricity and its Second Congress of Electronics, Telecommunications and Radio Broadcasting will be held in Mexico City, beginning Oct. 10. U.S. firms are invited to participate.

EXPORTS and IMPORTS

Britain exported $61 million worth of radio equipment in the first half of this year, $700,000 more than in the same period of 1957. Last year's exports reached a record value of $120 million, reports the Radio Industry Council.

West German tv set production during the first six months of 1958 amounted to 571,000 units, a 68 percent increase over the 340,000 units produced during the same period of last year. Exports during the first five months of 1958 increased by 60 percent to 88,000 sets. The Association of the Electrical Industry expects the present boom to continue through the sec-

ond half of this year. All of estimated total 1958 output of 1.25 million tv sets is expected to be sold.

British automatic direction finding equipment selling at $5,600 to $6,400 is being marketed by Ekco Electronics Ltd. Firm says vhf direction finder gives automatic cathode-ray-tube display of the sensed bearing of transmissions on any one selected frequency in the 118- to 132-mc band.

In London International Aeradio Ltd. says it has completed negotiations to supply Pye ground ILS equipment to Hungarian civil aviation authorities, and Standard Telephones & Cables airborne ILS equipment to Malev, the Hungarian airline.

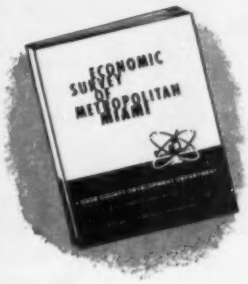
Belgian Atomic Energy Authority has ordered a high-speed Mercury electronic digital computer from Ferranti, Ltd., of Manchester. Firm says the $280,000 unit will handle scientific work. BAEA order is the 15th for the computer, which was introduced a year ago, and Ferranti says the Belgian agency is the 17th European atomic center to standardize on it. Others are at Geneva, Paris, Oslo, Stockholm and U.K. centers at Harwell and Risley.

Peiping Radio reports that a consignment of some 11,400 radio batteries has been sent from Red China to Iraq. The Tokyo-monitored broadcast didn't say who the consignee was or for how much the batteries were sold. A leading Japanese battery manufacturer said Red China started making batteries after the war, but they were of such poor quality that they could not sell in Southeast Asia.

In Australia four new Government-owned tv stations will cost about $6 million, with several contracts already let by the Postmaster-General Dept. and by the Australian Broadcasting Commission. Contracts have been given to Australian companies, which in most instances will buy the equipment abroad. Much of it is likely to come from British, Dutch and West German firms.

Management Executives—

SEND FOR NEW COMPLETE ECONOMIC STUDY OF METROPOLITAN MIAMI

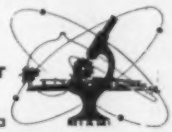


LET US SHOW YOU HOW YOUR COMPANY CAN PROFIT BY LOCATING IN THIS FAST GROWING AREA.

A 24 section, complete economic analysis has just been prepared to supply you with complete data which will assist in determining how your particular manufacturing or statewide, national/international distribution operation can profit here. This important study will be mailed to you free of charge—in strictest confidence—if you write, on your letterhead, to the address listed below.

Please . . . no employment applications. We are deluged with resumés from engineers, tool makers, technicians, Ph.D.'s, etc., and cannot possibly aid in placement requests as we already have a tremendous surplus of skilled and professional labor here now. Sorry.

WRITE John N. Gibson, Director
DADE COUNTY
DEVELOPMENT DEPARTMENT
Section: 34
Chamber of Commerce Bldg. • Miami, Florida



An agency of the Metropolitan Miami government

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McGraw-Hill Mailing Lists Will Help You

- Merchandise your advertising
- Conduct surveys
- Get inquiries and leads for your salesmen
- Pin-point geographical or functional groups
- Sell direct
- Build up weak territories
- Aid dealer relations

Direct Mail is a necessary supplement to a well rounded Business Paper advertising program.

Most progressive companies allocate a portion of their ad budgets to this second medium at the same time as they concentrate on the best business publications.

600,000 of the top buying influences in the fields covered by the McGraw-Hill publications make up our 150 mailing lists. Pick YOUR prospects out of our Industrial Direct Mail catalogue.

Write for your free copy.
It contains complete information.

For Missile Testing

and general use

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Available in Industrial and Military types. Military type meets specs MIL-E-4970 and MIL-I-6181. Other stationary and mobile styles available up to 1500 Amps.

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Over a Quarter Century of Rectifier Manufacturing

CIRCLE 18 READERS SERVICE CARD

BROADCASTING

Private Tv Links Win Appoval

New policy by FCC allows broadcasters to set up relay systems if doing so saves money

RECENT ACTION by Federal Communications Commission liberalizes policy on private intercity relay systems for tv broadcasters.

Under the new ruling, station licensees have the choice of installing their own private microwave links or of using common carrier facilities, depending on relative costs.

Previous policy made it mandatory that common carrier facilities be used when available. In addition, broadcasters who installed their own links in the absence of other systems were obliged to stop using them when common carrier facilities became available.

The new ruling is aimed at providing an economic lift to small market or marginal tv station operation. Stations that do install private links will now be able to take "off the air" program signals and use them for local and regional broadcasts.

Some restrictions accompanying the new ruling warn that private links may not be used as intermediate hops in a common carrier system. Also, no direct interconnection with common carriers will be allowed. FCC wording on the private links stipulates that they must be installed "without jeopardizing the orderly expansion of the national television program relay system operated by communications common carriers."

Private networks will lack the flexibility of regular common carrier systems, according to FCC, in that national network programming will be limited to that delivered to the initial station in the relay system. Also, unless two-way links are used, the station will not be able to feed program material to the network.

Broadcasters may operate intercity links on the same frequencies assigned for television pickup and studio-transmitter links. The use of these frequencies must, however, be on a secondary basis and subject to the condition that no harmful interference be caused to stations operating in the primary services.

Among those whom FCC expects to benefit from the new ruling are state educational tv networks and commercial broadcasters who will, in conjunction with other stations, be able to produce programs previously beyond their individual means.

In general, manufacturers feel that growth of the private links will move at a moderate pace. There is little talk of any plans for stepped-up sales campaigns or the introduction of special equipment at this time.

FCC ACTIONS

• **Schedules** September 16 prehearing conference for Newark Broadcasting Co. and WMGM Broadcasting Co., N. Y., on applications for new f-m stations.

• **Accepts** application from WSUB, Groton, Conn., for license to cover c-p authorizing a new standard broadcast station.

• **Notes** filing by Stark Broadcasting Corp., Canton, Ohio, for renewal of license for station WCMW.

• **Files** application from Arctic Broadcasting Assoc., Nome, Alaska, for c-p for new standard broadcast station to operate on 850 kc at 5 kw, unlimited hours.

• **Accepts** application from Hartford City, Ind., education authorities for noncommercial educational f-m station on 91.9 mc at 10-w power output.

• **Grants** permission to WAVE, Inc., Louisville, Ky., to operate main transmitter by remote control.

• **Allows** station WFMQ-FM, Chicago, Ill., to decrease erp to 11 kw, raise antenna height, change transmitter type.

• **Extends** completion date of station KLIR-FM, Denver, Colo., to November 18, 1958.

• **Issues** c-p to Brooksville Broadcasting Service, Brooksville, Fla., for installation of new transmitter, change in studio location, and operation by remote control.

STATION MOVES and PLANS

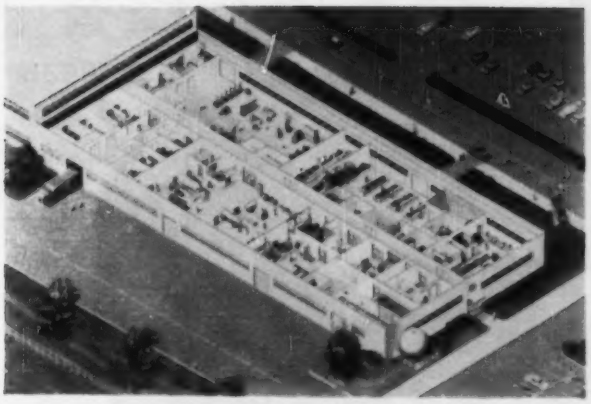
WBUF, Buffalo, N.Y., files for modification of c-p to allow extension of completion date of new tv station.

WGBH-TV, Boston, Mass., is granted c-p to change erp to visual 100 kw, aural 50 kw; change in transmitters, installation of power amplifiers and other equipment.

WNDU, South Bend, Ind., obtains license for tv station, erp: visual 234 kw, aural 117 kw.

WBAL, Baltimore, Md., plans changing location of auxiliary transmitter and antenna.

WKAI, Macomb, Ill., receives permission to install new transmitter.



Tag $35 Million for R&D

REPUBLIC Aviation Corp. reports it is embarking on a $35 million research and development program "to intensify development of the advanced forms of aircraft, missiles and spacecraft called for in the aeronautical industry's transition to astronautics".

A four-year program includes the erection of a $14 million Engineering Research and Development Center (see artist's sketch) at the firm's main plant in Farmingdale, L. I., to house highly specialized R&D laboratories, says Mundy I. Peale, president.

The program also calls for major expansion of the firm's technical personnel by the addition of scientists and engineers to the engineering, development and scientific research staffs.

In a letter to stockholders, Peale said the comprehensive program has these objectives: to develop new, sophisticated forms of aircraft, to develop new families of missiles and missile systems yet uncharted, and to stimulate design of manned vehicles for space travel. A corollary of this intensive effort, he said, would be the creation of "a host of new products and hardware" to support this technological advance.

New R&D laboratories to be built include: a space environmental development lab; a reentry simulation and aerodynamic development lab; a materials development lab; an electronics development lab; a guidance and control system development lab; an advanced fluid systems development lab; and three process labs to aid manufacturing R&D.

Raytheon: Six New Buildings

RECENTLY placed under construction in Massachusetts locations, six new buildings reflect mushrooming operations of Raytheon Manufacturing Co. Firm has announced second-quarter sales of $98,708,000, compared to $59,680,000 for same period in '57. Backlog of orders in firm's 11 divisions exceeds $325 million.

Employee roster is approaching 33,000, an increase of more than 8,000 in past year, equal to total employe boost from 1952 to 1957.

Giant's share of Raytheon operations is in Massachusetts, with other facilities in California, Tennessee, New Mexico and New Hampshire.

Now abuilding are: $250,000 administration center for missile systems division plant in Lowell, Mass.; 140,000 sq ft Spencer Laboratory in Burlington, named for manager of microwave and power tube division and one of the early leaders of the company; government equipment division's new plant in Sudbury, to be built in two 80,000 sq ft sections over two-year period; $1½ million hangar being built for Raytheon by Navy at Hanscom Field, Bedford; data processing center in Watertown to house Datamatic 1,000 computer; new 60,000 sq ft wing on Wayland Laboratory, to be completed by end of '58.

Construction will add 460,000 sq ft to firm's present 5,800,000.

In addition, government equipment division is taking over former woolen mill in North Dighton, Mass., for assembly and testing of radar, communications, sonar and other electronic equipment.

Sylvania Names Vigneron

APPOINTMENT of Eugene J. Vigneron (picture) as manager of the Needham, Mass., operations of Sylvania Electronic Systems is announced. He will be responsible for the operation of the recently opened 102,000-sq ft facility there.

Announce New Corporation

FORMATION of Genesys Corp., a wholly-owned subsidiary specializing in the field of electronics was recently announced by Chance Vought Aircraft, Inc., Dallas, Texas.

Operating in Los Angeles as a general systems and products company, Genesys will specialize in the design, development and manu-

(Continued on p 40)

We have a house to put in order...

WE HAVE A HOUSE to put in order . . . and it's the house where America lives.

Of our country's many million homes, more than 1 out of every 10 are out-and-out slums. Nearly one-half of all American dwellings are in poor to "fair" condition, and urgently need basic repairs.

Something *must* be done—both to correct the slums of today and *prevent* the slums of tomorrow.

How do slums start? Usually just one house starts to slide downhill and soon a whole block changes. Pride is lost. Other houses are neglected, decay spreads.

So the 20 million homes in need of basic repair and improvements deserve equal attention. The time to stop the spreading blight of slums is *before it starts.*

What's your stake in stopping slums?

If you think your town is different, just look around you . . . If you think slums only affect persons who live in them, think again.

Slums raise taxes and lower property values of the whole town. They raise rates of crime, delinquency and disease. *Everyone* has a real stake in stopping slums. And *that includes you as a businessman.*

Your firm is certainly dependent on the welfare of the community where you do business. But it's more than good business—it's good citizenship to take part in efforts aimed at civic improvements. It's the *responsibility* of every business.

What can your firm do? The answer to America's housing problems starts with individuals. But to roll back slums is such a big job it's going to take more than individual effort. It will need the cooperation of your business and many others.

Some slums should be torn down and a fresh start made. Others can be remodeled and made to conform to better living standards. So it is up to you to support every sound program which seeks adequate housing for all our people.

New help is now available

There is a new national, non-profit organization called A.C.T.I.O.N.—The American Council To Improve Our Neighborhoods—which is designed to help all individuals or groups interested in putting America's house in order.

Send for a free copy of "ACTION." It explains what A.C.T.I.O.N. is and proposes to do. It lists booklets, research, check-lists, and other material which can help you. Address P. O. Box 500, Radio City Station, New York 20, N. Y.

ACTION

American Council To Improve Our Neighborhoods

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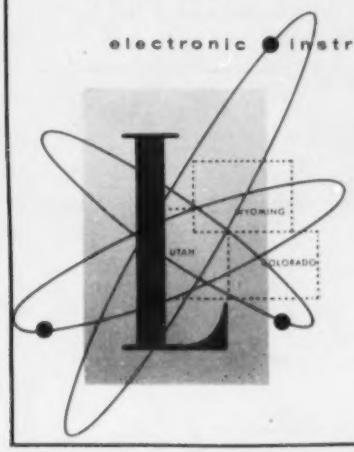

IN THE ROCKY MOUNTAIN REGION

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follow the sun

TO PHOENIX!

...where Motorola offers rewarding opportunities!

Work where it's fun to live. Advance your career—both in recognition and financial gain—at Motorola in Phoenix.

Your *family* will share your opportunity when you settle down in sunny, dry, healthful Phoenix! Tourists spend millions of dollars every year just to visit Phoenix. The attractions of this fabulous vacationland can be yours to enjoy *year-'round* with Motorola!

EQUAL JOB OPPORTUNITY — For All Qualified Applicants

If you are qualified for any of the positions below, write, wire or phone today.

ELECTRONIC ENGINEERS, MECHANICAL ENGINEERS, PHYSICISTS

System Analysis, Design and Test
Radar — Communications
Navigation — Missile Guidance
Data Processing and Display

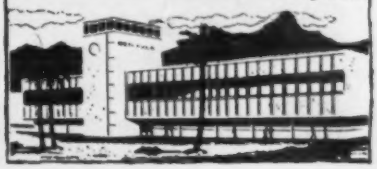
Circuit Design, Development and Packaging
Microwave — Pulse and Video
Antenna — Digital and Analog
R-F and I-F — Transistor
Servos

Technical and Specification Writing
Printed and Etched Circuitry

Write:
Mr. Kel Rowan
Western Military Electronics Center
Motorola, Inc., Dept. A-9
8201 E. McDowell Road
Phoenix, Arizona

Engineering positions also available at Motorola, Inc. in Chicago, Illinois, and Riverside, California.

MOTOROLA, INC.



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Manufacturers Representative: Open territory in Florida, Alabama and Georgia for experienced commission sales engineer. Firm is growing and well established mid-west manufacturer of plastic and metal electronic wiring devices and printed circuits. RW-8626, Electronics.

POSITION WANTED

Assistant Dept Manager. Electronics background seeks administrative assistant, sales or purchasing. PW-8710, Electronics.

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Well known, aggressive rep in Chicagoland area now seeking good industrial component and instrument lines as well as additional jobber and hifi lines. Staff recently supplemented by electronics engineer of 13 years experience and formal education. RA-8643, Electronics.

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New finest high-quality multi-tap potentiometer meeting rigid military specifications selling for substantially less than comparable commercial products. 36 multi-tap model sells for $99.00.

All national territories open. Direct replies to

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Research-Design-Development
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SAMUEL K. MACDONALD, INC.
manufacturers representatives over 25 years
1531 SPRUCE STREET, PHILA. 2, PA.
Territory: Pennsylvania • New Jersey • Delaware • Maryland • Virginia • West Virginia • District of Columbia
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IN LESS THAN 4 SECONDS

FROM THIS

TO THIS

OR THIS

WITH THE REVOLUTIONARY PRODUCTION AID TOOL!

"PIG-TAILOR"®

Foot operated
No accessories
3 minute set up

$125.00

"PIG-TAILORING"

a revolutionary new mechanical process for higher production at lower costs. Fastest PREPARATION and ASSEMBLY of Resistors, Capacitors, Diodes and all other axial lead components for TERMINAL BOARDS, PRINTED CIRCUITS and MINIATURIZED ASSEMBLIES.

PIG-TAILORING eliminates: **• Diagonal cutters • Long nose pliers • Operator judgment • 90% operator training time • Broken components • Broken leads • Short circuits from clippings • 65% chassis handling • Excessive lead tautness • Haphazard assembly methods.**

PIG-TAILORING provides: **• Uniform component position • Uniform marking exposure • Miniaturization spacing control • "S" leads for terminals • "U" leads for printed circuits • Individual cut and bend lengths • Better time/rate analysis • Closer cost control • Invaluable labor saving • Immediate cost recovery.**

Pays for itself in 2 weeks

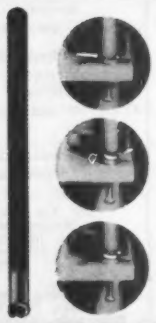
"SPIN-PIN"®

Close-up views of "SPIN-PIN" illustrate fast assembly of tailored-lead wire to terminal.

- **No Training**
- **No Pliers**
- **No Clippings**
- **Uniform Crimps**
- **22 Sizes**

PAYS FOR ITSELF THE FIRST DAY!

$5.00 EACH



Write for illustrated book to Dept 9EP.

BRUNO-NEW YORK INDUSTRIES CORP.

DESIGNERS & MANUFACTURERS OF ELECTRONIC EQUIPMENT

460 WEST 34th STREET • NEW YORK 1, N. Y.

CIRCLE 19 READERS SERVICE CARD

(Continued from p 37)

facture of advanced control computer systems, components and allied products. Major emphasis will be on commercial and industrial applications.

Officers of the new corporation are H. B. Gibbons, president; Geoffrey Post, vice president—engineering; John P. Lekas, vice president—product development; John F. Davis, vice president—marketing; J. W. Owens, treasurer, and H. E. Kay, secretary.

News of Reps

General Electric's two-way radio equipment will be handled by **Radio Message Service, Inc.** in Georgia, Alabama and Tennessee.

St. John X-Ray Laboratory, Califon, N. J., names **C. L. Safford, Jr.**, as rep for its film badge service in Michigan, Ohio and western Pennsylvania.

Jules J. Bressler & Co. will cover metropolitan New York for Merit Coil & Transformer Corp., Hollywood, Fla.

Murphy and Cota Co. will market Daystrom Pacific's precision pots in North Carolina, South Carolina, Georgia, Alabama, Tennessee, Mississippi and Florida.

Ace Electronics Associates, Inc., Somerville, Mass., potentiometer manufacturers, appoint **William Kessler, Walter Lippman,** and **Jack Kessler,** of Winfield Electronics Sales, as engineering-sales reps for the state of Florida.

Fisher Berkeley Corp., Emeryville, Calif., appoints the following reps for its Ektacom line of intercommunication equipment:

Harry N. Reizes, for metropolitan New York, upstate New York and northern New Jersey; **Robert S. Reiss Associates,** for New England.

Andrews and Andrews, manufacturers rep firm, has been re-established in Tenafly, N. J. Firm will cover metropolitan New York and northern New Jersey.

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electronics' READER SERVICE
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(1) Circle number on postpaid card below that corresponds to number at the bottom of Advertisement, or New Product item.

(2) Print your name, title, address, and firm name carefully. It is impossible to process cards that are not readable.

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Certain multi-product advertisements contain Reader Service numbers for each product.

For multi-product advertisements that are not keyed for Reader Service, indicate in box on postcard marked with asterisk (*) ad circle number(s) and specific product(s) on which you want more information.

Additional postage MUST be added to cards for all FOREIGN MAILINGS

Some Advertisements which cannot be numbered for the READER SERVICE Card due to lack of space, must be indicated by writing the Advertiser's name in the space provided at the bottom of the card . . .

SEP 5 • 58
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• electronics •
BUSINESS ISSUE

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COMPANY _____

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INSIDE FRONT COVER — INSIDE BACK COVER

MEMO:

NEW PRODUCTS RELEASES

TO: ALL MANUFACTURERS

FROM: electronics

electronics publishes all new product items of interest to makers and users of electronic and allied equipment.

The reverse side of this card provides a service to subscribers by facilitating the flow of additional information between manufacturers and our readers.

Take advantage of Reader Service--and the readership of electronics...keep the industry informed about your New Products and New Literature via their mention in the editorial pages of electronics.

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NEW YORK, N. Y.

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New York 36, N. Y.

Radar and the Crusades

The scene: England at the time of the Third Crusade. The date: Tuesday, August 8, 1189. After years of secret preparation, the first radar installations intended for use in the Near East campaign were ready at last to begin their long sea journey. All England was agog with hope and excitement. The newspapers sent their best men to Stoke Poges-on-the-Chutney to cover the event.

The equipment was a towering monument to medieval genius — an achievement of the first water, so to speak. Mountains of stout English oak encased components marvelously wrought of myrrh, dried bat's wings, and the bones of sheep born on Thursday. The tubes were of stained glass, with fireflies inside to make them glow. Unfortunately, however, since this was long before the days of miniaturization, the installations were cumbersome as waltzing elephants and heavier then Dr. Jekyll's conscience. As a result, the ship went down faster than you can say "man overboard" — even before loading was completed.*

The nation's press reflected the disappointment felt throughout the land. Headlined the august London Times: "CRUSADER RADAR NO CRUISE AIDER" Commented Stoke Poges Confidential: "CONFIDENTIALLY, IT SINKS."

** as, for example, in modern miniaturized tubes like those made by a company which shall be nameless — called Bomac.*

No. 9 of a series . . . BOMAC LOOKS AT RADAR THROUGH THE AGES

*Bomac makes the finest microwave tubes and components this side of Stoke Poges-on-the-Chutney

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